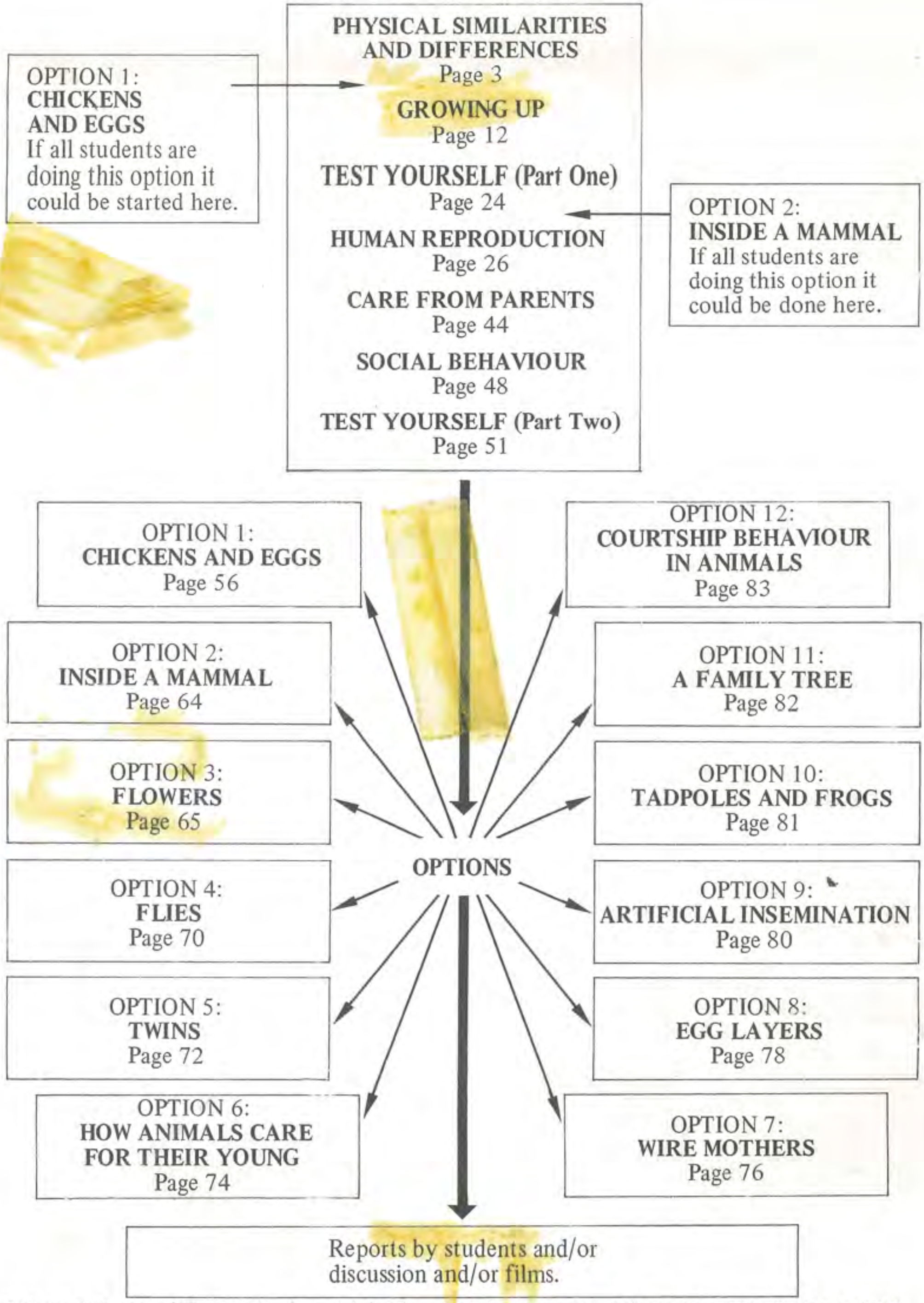
Males and Females

asep

AUSTRALIAN SCIENCE EDUCATION PROJECT

PLAN



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This book is part of the learning material developed by the Australian Science Education Project (ASEP). The project was funded by the Commonwealth and State governments of Australia.

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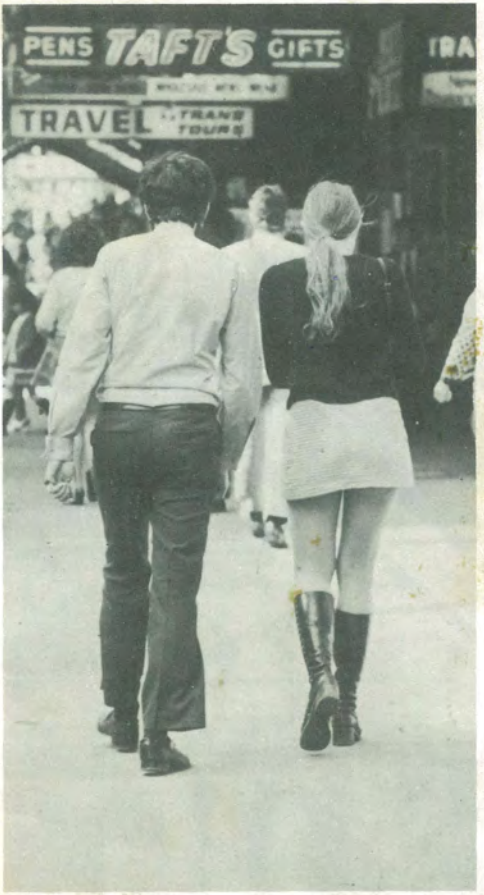
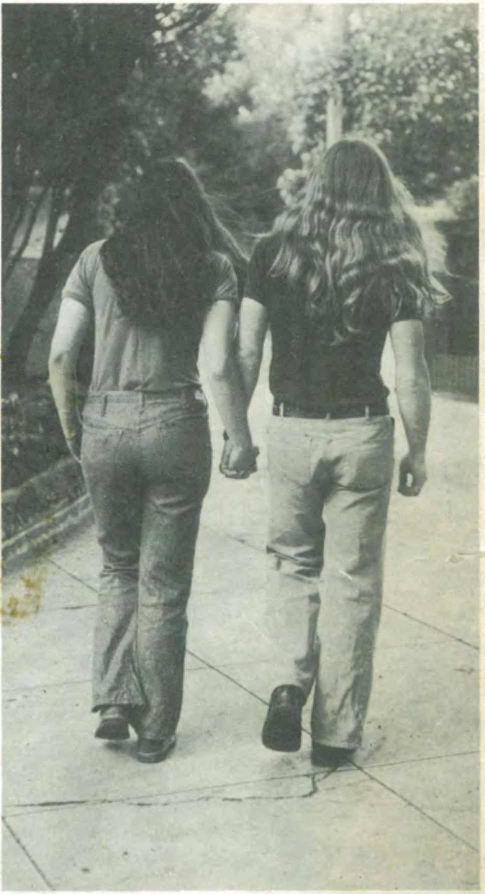
ISBN 0 7241 1072 0

Physical Similarities and Differences

Here are photos of two pairs of teen-agers. Can you tell which is the male and which is the female in each pair?





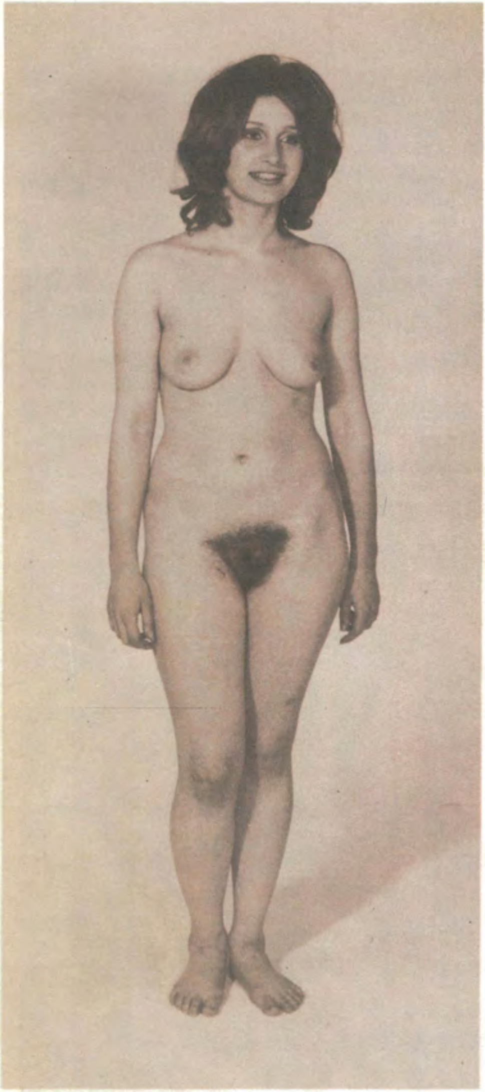
CAMPBELLTOWN HIGH SCHOOL

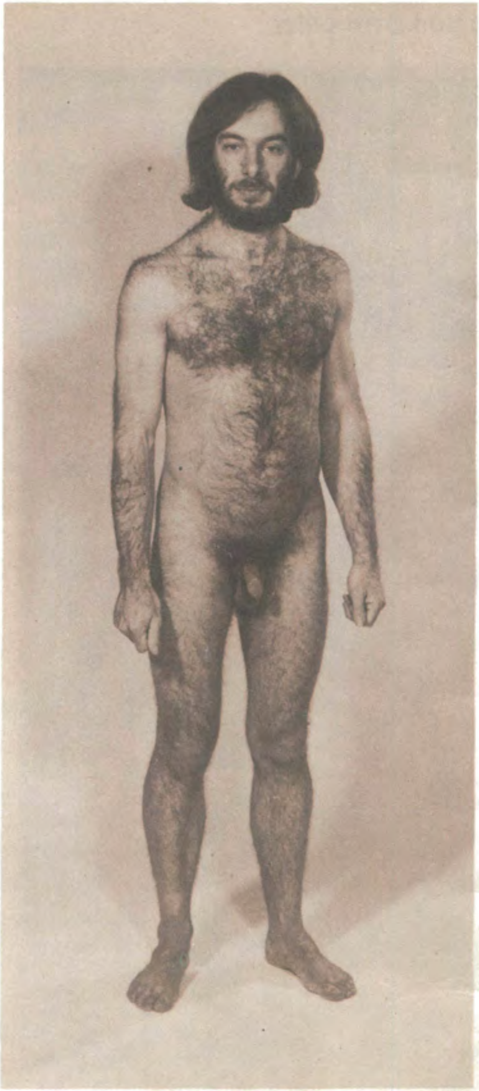
You are either a boy or a girl. As a person, you are labelled either 'MALE' or 'FEMALE'.

Males and Females will help you to learn more about the similarities and the differences between males and females.

You will also learn more about the changes that take place in your body as you grow older.

There are differences between men and women. The differences in their bodies are called **physical differences**.





✍ 1 Try to think of some physical differences between men and women. Write some of these differences in the table on page 3 of your record book. (When you see this symbol ✍ you will need to write in your record book.)

There are some similarities, too. Write some of these in the table.

Throwing Ability

Who can generally throw a ball farther, a boy or a girl? You can investigate this. You will need a ball, a tape-measure, and someone to record the distance from the thrower to the place where the ball lands.

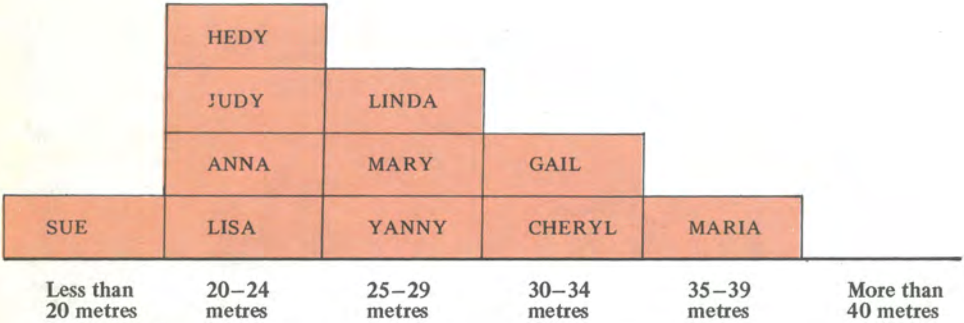
Each person in the class may have one throw. You should be standing still when you throw the ball.

✍ 2 On page 4 of your record book write the distances the students in your class threw the ball.

GIRLS' NAMES	DISTANCE BALL WAS THROWN IN METRES
YANNY	28
LISA	21
ANNA	24
MARY	27
CHERYL	34
MARIA	38
GAIL	33
JUDY	22
SUE	18
HEDY	24
LINDA	26

These results were recorded by girls in a group of students aged about thirteen. The girls threw a cricket ball. They were standing still when they threw the ball.

One way to compare the distances thrown by each girl is to separate the throwers into groups according to how far they can throw. You can show this comparison by using a **distribution graph** like the one below. Compare the distribution graph with the table at left. Make sure you can see how the graph was made.



These results were recorded by the boys in the same class.

BOYS' NAMES	DISTANCE BALL WAS THROWN IN METRES
GARRY	32
CARLO	34
GAVIN	37
PETER	18
MARK	42
IAN	41
TONY	34
SPIROS	22
RON	26
KEN	38
KARL	26

✍ 3 The distribution graph for the table at left has been drawn on page 5 of your record book. Answer the questions about this graph in your record book.

These distribution graphs show that generally the boys in this group threw the ball farther than the girls.

✍ 4 Draw distribution graphs for the students in your group on page 6 of your record book.

✍ 5 What opinion have you formed about the throwing ability of boys and girls? Write two or three sentences about this on page 7 of your record book.

This is just one way in which members of the same sex may differ from each other.

Athletic Ability

Here are some world records for athletics and swimming for both males and females.

ATHLETICS RECORDS*

EVENT	MEN	WOMEN
100 metres	9.9 s	11.0 s
200 metres	19.8 s	22.4 s
800 metres	1 min 44.3 s	1 min 58.5 s
1500 metres	3 min 33.1 s	4 min 01.4 s
Long jump	8.90 m	6.54 m
High jump	2.29 m	1.94 m

SWIMMING RECORDS*

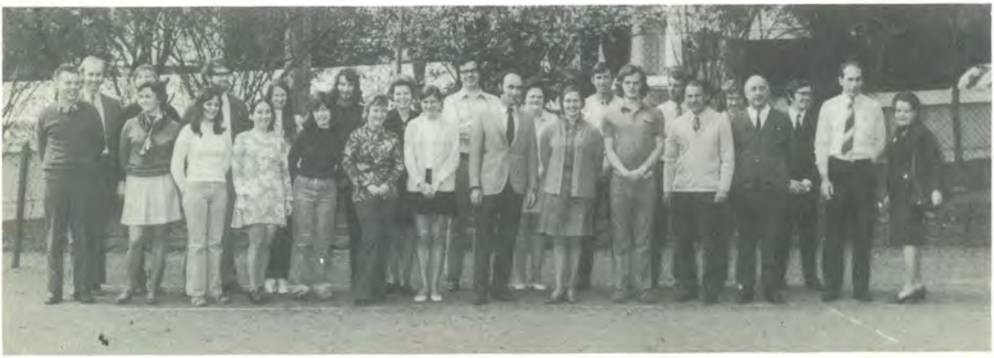
EVENT	MEN	WOMEN
100 m freestyle	51.2 s	58.5 s
200 m freestyle	1 min 52.8 s	2 min 03.6 s
800 m freestyle	8 min 23.8 s	8 min 53.7 s

* As at 1 January 1973.

6 Do you think that males are generally physically stronger than females? Write reasons for your answer on page 7 of your record book.

Size

Size is another physical difference. Look at this photo.



7 Which sex do you think is generally taller and heavier?

Life Expectancy

Records which show how old a person is when he or she dies have been used to work out the average number of years a person can expect to live. This is called life expectancy.

The table below shows the average life expectancy of male and female Australians of various ages.* For example, a male aged 10 could expect to live 60 more years.

AGE AT PRESENT	MALES	FEMALES
10	60	66
20	50	56
30	41	47
40	32	37
50	23	28
60	16	20
70	10	12
80	6	7
90	3	3

8 Which sex generally lives longer?

Resistance to Disease

Now look at this table, which shows the number of people surviving from each 1000 births.*

AT AGE	MALES	FEMALES
10	970	976
20	962	972
40	928	954
60	774	865
80	246	434

9 Which sex generally has greater resistance to disease? (Assume that most deaths were because of disease.)

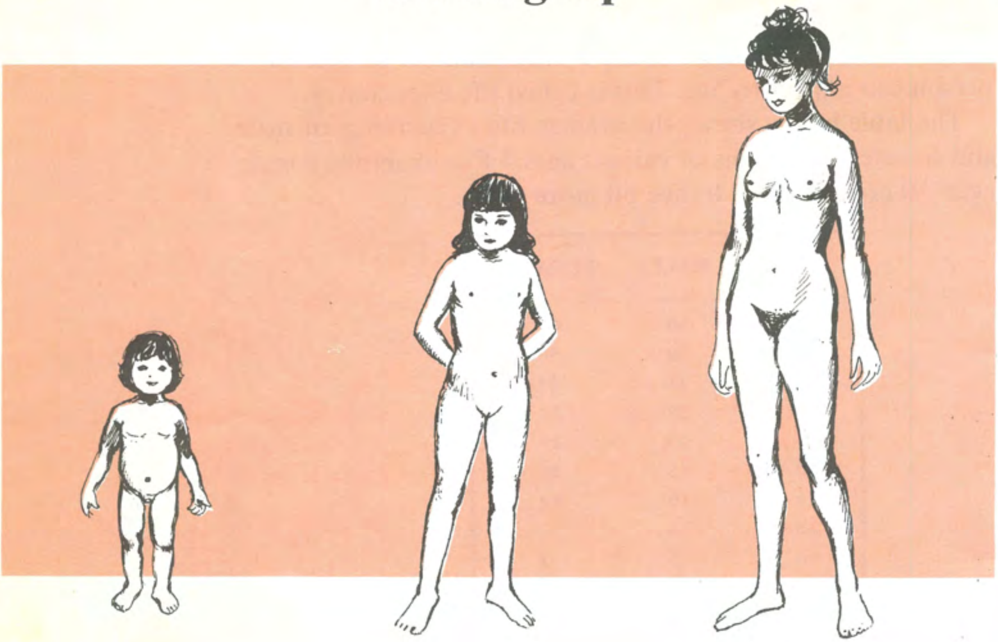
The differences you have been reading about—appearance, strength, size, life expectancy, resistance to disease—are average differences.

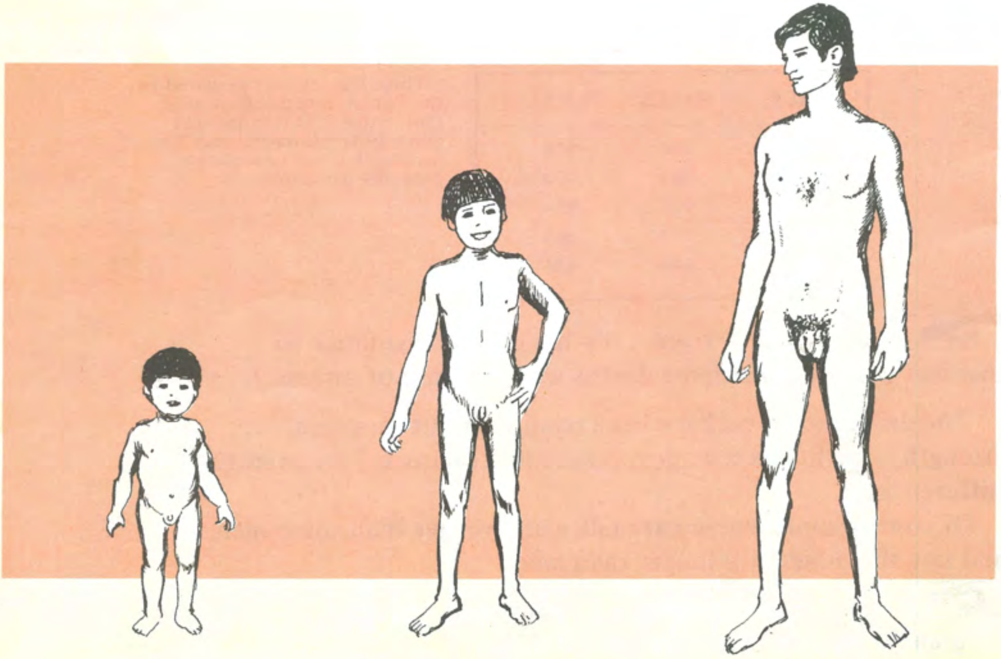
Of course, some women are taller or stronger than some men, and not all women live longer than men.

10 Now try to add to your list of physical differences on page 3 of your record book.

* These figures were prepared by the Commonwealth Bureau of Census and Statistics in 1961. Since 1961 life expectancy has increased, that is, people are generally living longer.

Growing Up





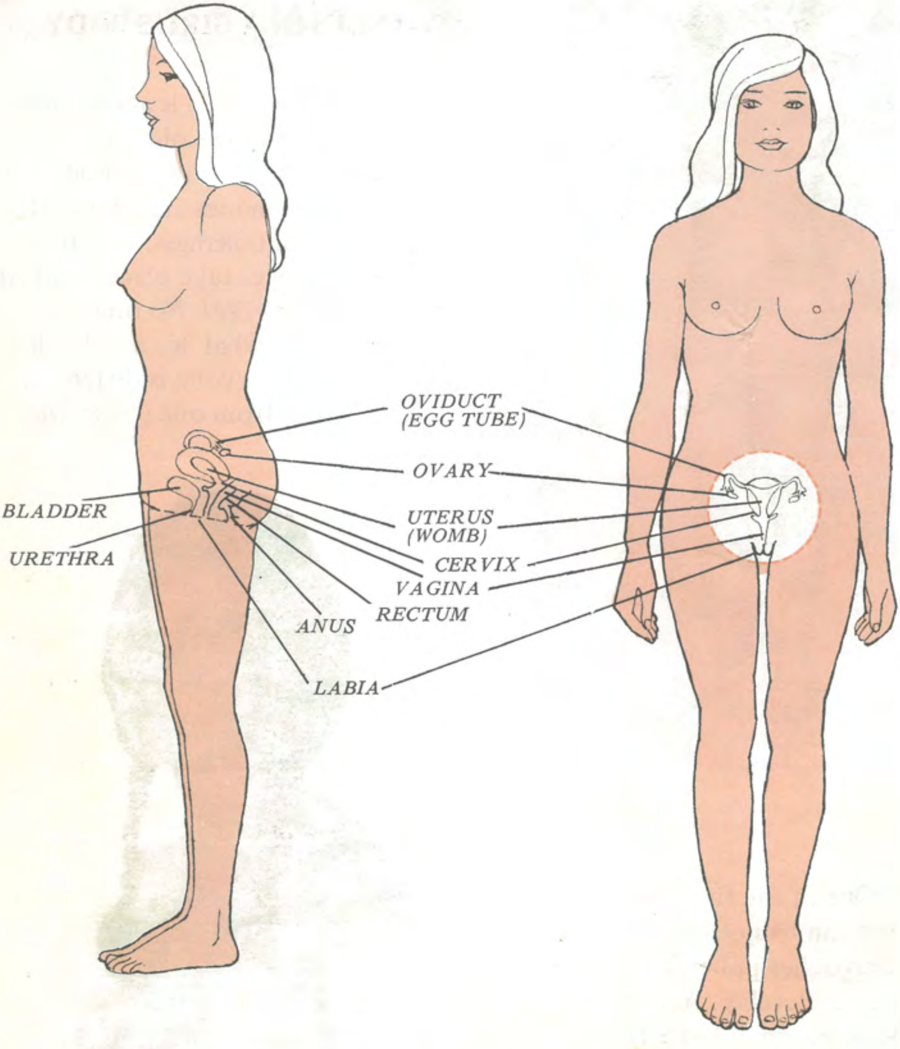
In this section you will look at the changes that take place in your body as you grow up.

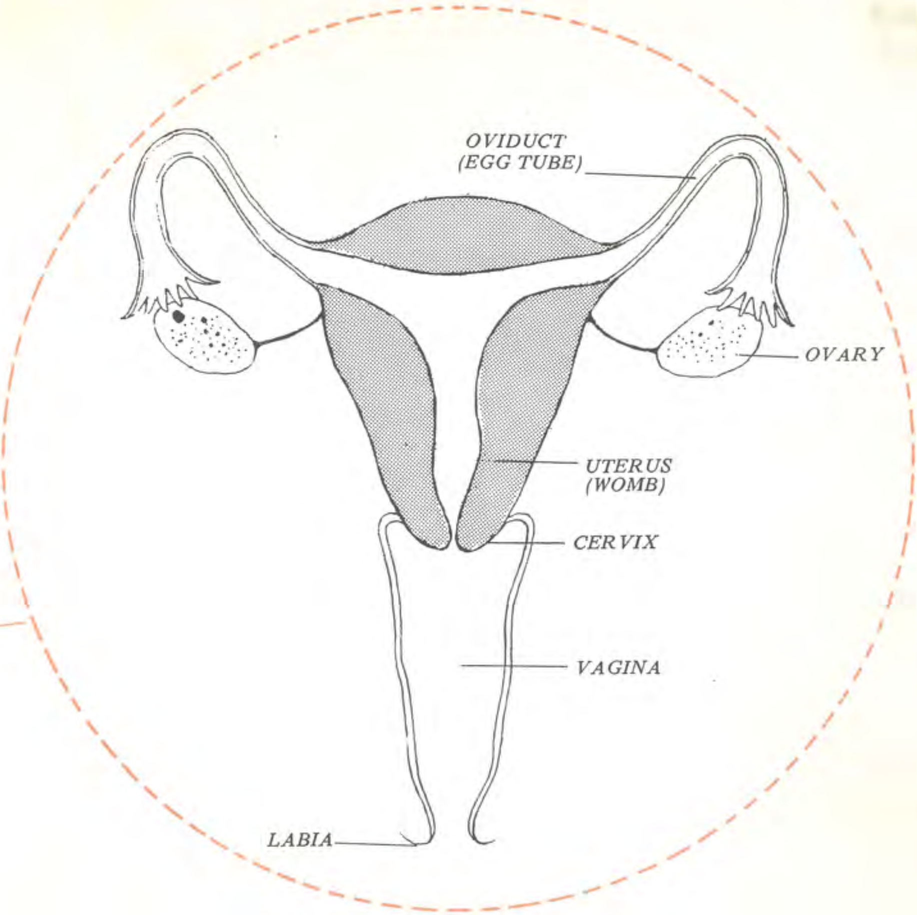
CHANGES IN A GIRL'S BODY

The girl in this photo is about eight years old. As she grows older more female sex hormones will be produced in her body. **Hormones** are chemicals which bring about changes. The time when these changes take place is called **puberty** *(PEW-ber-tee).* No one can tell in advance at what age a girl will reach puberty. Everyone is different, so the age varies from one girl to the next.

One of the first changes that can be noticed as a girl approaches puberty is that her breasts develop. Also her whole body becomes more rounded.

Before reading about the other changes that take place at puberty you need to know the names for parts of the female body. Look at the diagrams below.





The thick-walled centre part shown in the diagram above is the **uterus** *(YOO-ter-us)* or womb *(WOOM)*. The two tubes on either side of the uterus are the **oviducts** (often called **egg tubes**). These tubes have funnel-shaped openings near the ovaries *(OH-va-rees)*. When a girl is born she has thousands of undeveloped eggs in each ovary. These eggs are also called **ova**.

The large tube below the uterus is the **vagina** *(va-JIE-na)*. The folds of skin around the entrance to the vagina are called **labia** *(LAY-bee-a)*.

This black dot represents the size of an egg.

11 On page 8 of your record book there is a diagram of the parts of the female body. Try to label each part.

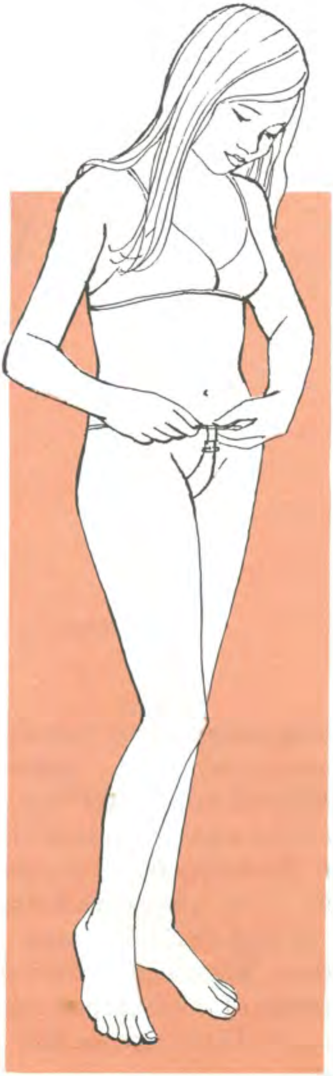
After a girl reaches puberty she loses blood and liquid about once a month, through the vagina. This process is called **menstruation** *(MEN-strew-ay-shun).* Often menstruation is called a 'period'.

Menstruation is a perfectly natural process and girls have nothing to worry about when it occurs.

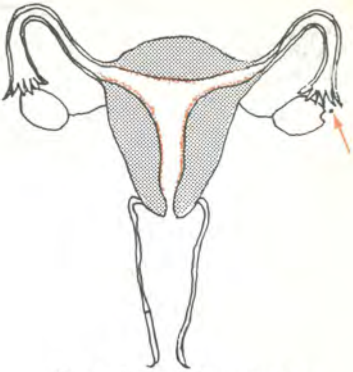
Most girls start menstruating between the ages of 11 and 15; some start before that age and some start when they are older.

During menstruation a girl may wear a pad of gauze filled with cotton over the entrance to the vagina. This pad absorbs the menstrual liquid, and is held in place by a belt or in special panties.

Instead of using an outside pad, a roller-shaped piece of cotton called a tampon may be put into the vagina. The tampon absorbs the liquid as it leaves the uterus. However, before using tampons it is a good idea to get more information from your family, a doctor or booklets about menstruation.

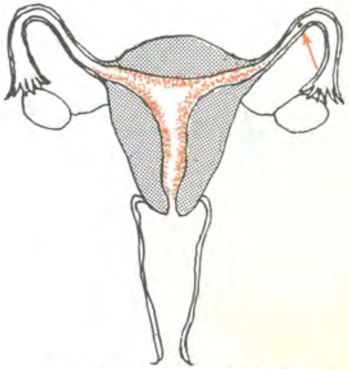


As a girl grows up, some of the eggs in her ovaries develop. One egg is released from an ovary about every four weeks. This tiny egg moves along the oviduct toward the uterus.



Egg released from ovary.

While the egg is moving, a thick lining continues to develop in the uterus.

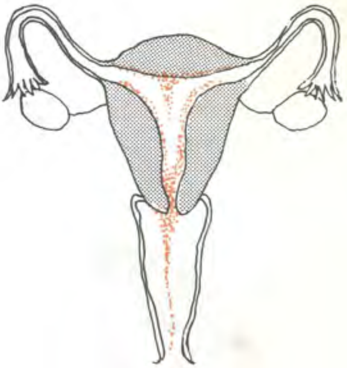


Lining continues to thicken.

Part of the lining, together with liquid and some blood, comes out through the vagina during menstruation. This 'period' usually lasts several days.

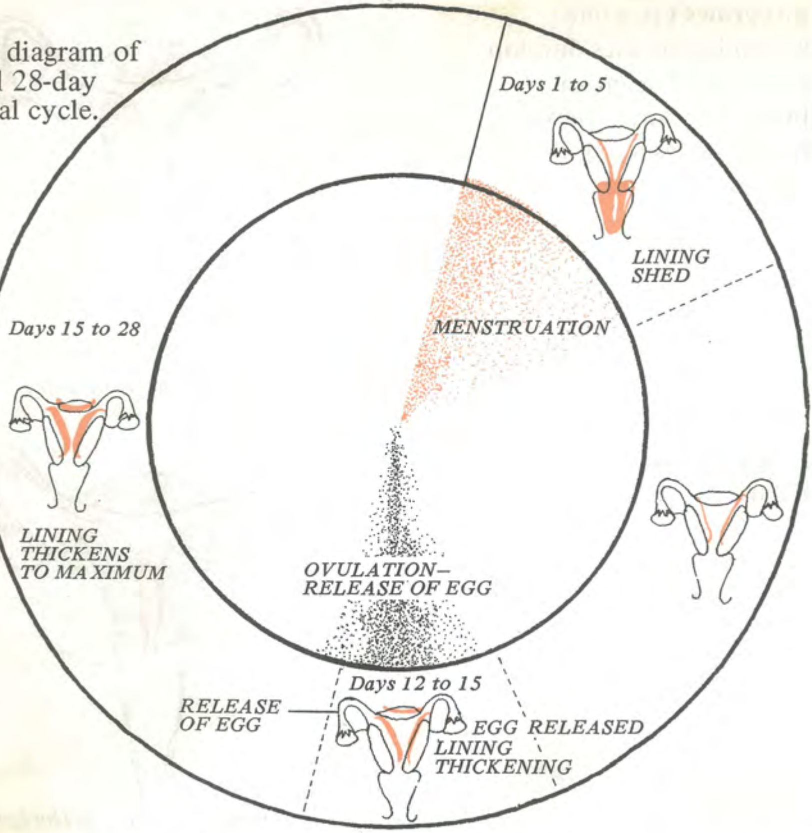
The whole cycle usually takes about 28 days and is controlled by **hormones**– the body chemicals that move around in the girl's blood stream.

When a girl first begins menstruating, her menstrual cycle may vary in length of time. It may take a few years to become more regular.



Lining is shed.

This is a diagram of a typical 28-day menstrual cycle.



12 Complete the diagram of a menstrual cycle on page 8 of your record book.

If you want to find out more about menstruation, you could read booklets about it. A teacher may be able to give you the name of a booklet.

Another change in a girl at puberty is the appearance of hair on her body. Look at the photo at the left and the photo of the woman on page 6.

13 Whereabouts on their bodies is hair growing? Write your answer on page 9 of your record book.

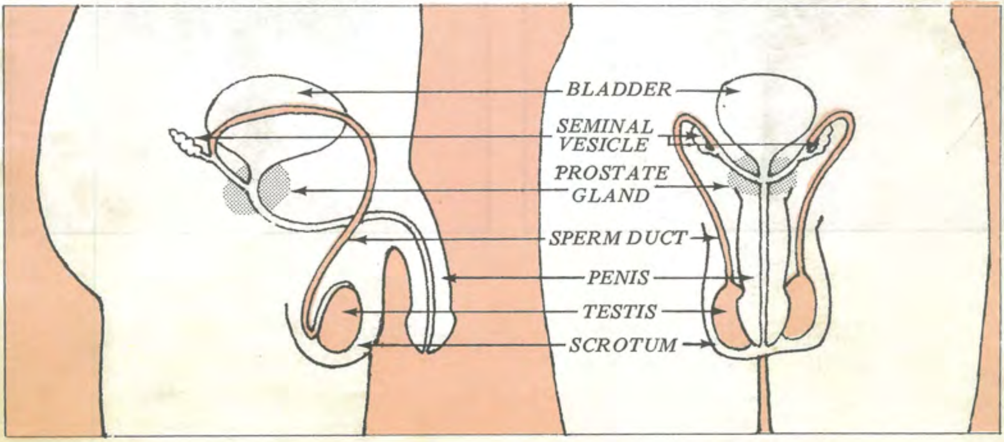
CHANGES IN A BOY'S BODY

So far we have been looking at the changes that occur in girls. Many changes occur in boys as they grow older, too.

Boys are born with a **penis** *(PEE-nes)* and two **testes** *(TES-tees).* The testes are shaped like oval balls. They are under the penis in a little bag called a **scrotum** *(SCROH-tum).*

Small cells called sperm are produced in the testes **after** the boy reaches puberty. (Remember that undeveloped eggs are present in a girl at birth.)

When a boy reaches puberty, his penis has two functions. It still carries urine out of the body, but is now able to carry sperm out as well. The sperm are carried out of the body in a sticky white liquid called **semen**. The urine and the semen pass out of the penis at different times. They do not mix together. (Further details on the ejection of semen will be given later.)



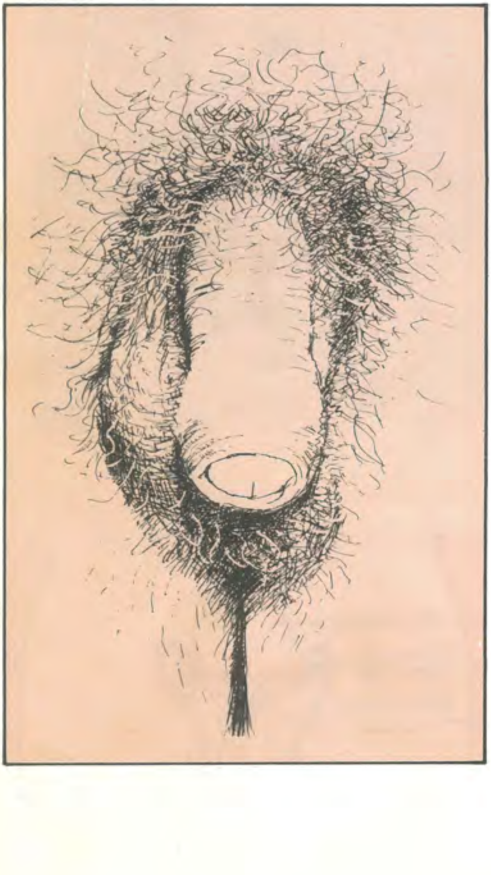
When a boy reaches puberty he may have what are commonly called 'wet dreams'. While he is asleep semen may be ejected from his penis. Some 'wet dreams' have a sexual content. In other instances there are no feelings of sexual excitement. A 'wet dream' is a normal happening.

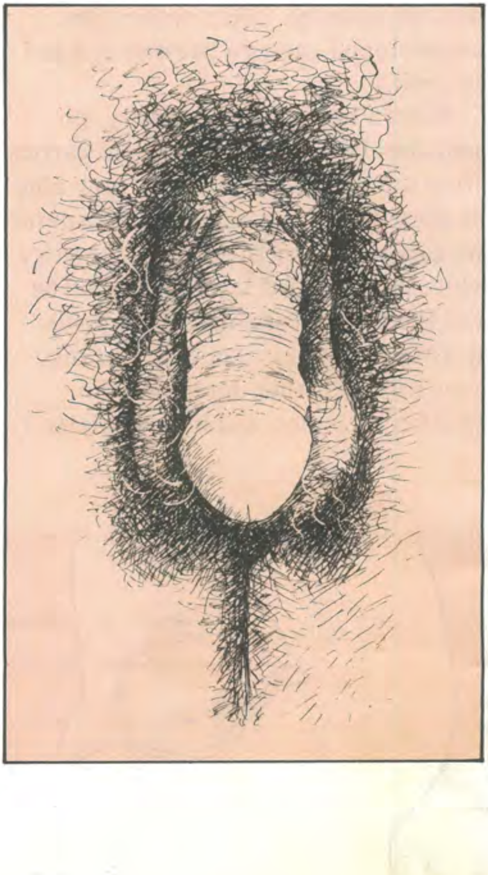
There is a difference between the penises of the two men in the diagrams below. The penis on the left still has the foreskin over the end.

The penis on the right has had the foreskin removed.

This operation is called **circumcision.** It is sometimes done at birth on a baby boy as a matter of custom or for medical reasons. In some religions circumcision is a rite dating from ancient times.

✍ 14 Turn to page 9 of your record book and try to label the parts of the male body.



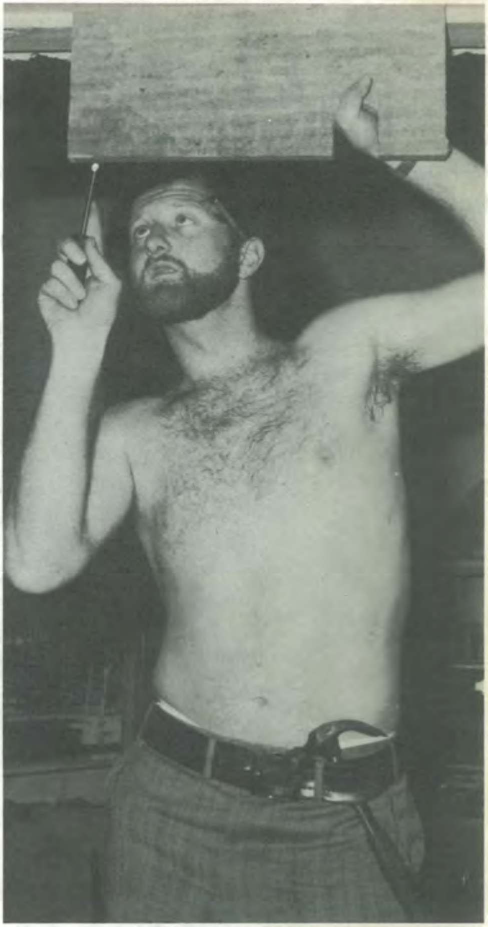


At puberty hair begins to grow on a boy's body. Look at this photo and the photo on page 6.

15 Where does hair grow on a boy's body after puberty? Write your answer on page 9 of your record book.

Some men have very little hair on their chests or none at all–people are different.

There is another change that takes place in a boy as he grows up. Have you heard a boy's voice when it is 'breaking'? As his vocal cords grow larger he begins to speak with a deeper voice. The **larynx** *(LA-rincks)* is the organ which contains the vocal cords.



The bulge showing the position of the larynx (sometimes called the Adam's apple) is usually much more prominent in males than in females. This is another physical difference which may make like to add to your list.

OTHER KINDS OF CHANGES

After puberty the bodies of boys and girls have changed in the ways you have just read about.

Girls usually reach puberty at a younger age than boys. But all of these changes take place at different times in different people.

So far you have read only about changes that take place in your body. But there are other kinds of changes that take place, too.

Young boys tend to play together and young girls tend to play together.

However, as boys and girls reach puberty they may feel more attracted to each other. They begin to enjoy each other's company more.

Both boys and girls may begin to feel more independent. Because of the changes taking place during puberty, boys and girls may feel very happy one moment and very sad the next. This sometimes upsets the parents of maturing boys and girls.

As you grow up you may feel that adults do not understand you. This is all part of growing up and these problems may be overcome by talking with your family.

You may like to discuss some of these changes with other students.

✍ 16 Make a list of the changes that take place in boys and girls (page 10 of your record book). These are the changes that you have been reading about so far in *Males and Females.*

TEST YOURSELF (Part One)

This test is to help you find out if you understand what you have been doing. It is not a test for marks. For some questions, you have to choose the best answer from the several answers suggested. In each of these cases, write on page 11 of your record book only the letter of the answer which you choose.

It is important that all your answers are your own work.

Questions 1–8 refer to the diagrams opposite, which show some of the organs in the human body.

From the list of words below, choose the names for the organs numbered 1–8 in the diagrams. In each case, write the name which you choose.

Uterus (womb)	Bladder	Scrotum	Cervix
Penis	Oviduct	Anus	Vagina
Ovary	Testis	Labia	Urethra

---

9 After a girl reaches puberty an egg is released from one of her ovaries about once a month. About two weeks after the release of the egg the uterus loses some blood and other liquid. What is this loss of blood and other liquid called?

10 Which one of the following statements about the formation of egg cells (ova) in women is true? The egg cells are

- A first formed at puberty.
- B formed after each monthly period.
- C formed during sexual intercourse.
- D present at birth, but only start developing at puberty.

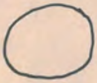
11 Some boys have an operation called circumcision. This operation involves the removal of the

- A tip of the penis.
- B foreskin.
- C testes.
- D scrotum.

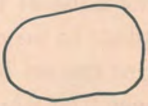
12 Which one of the following best shows the actual size of an egg (ovum) released from the ovary of a women?

A

B



C



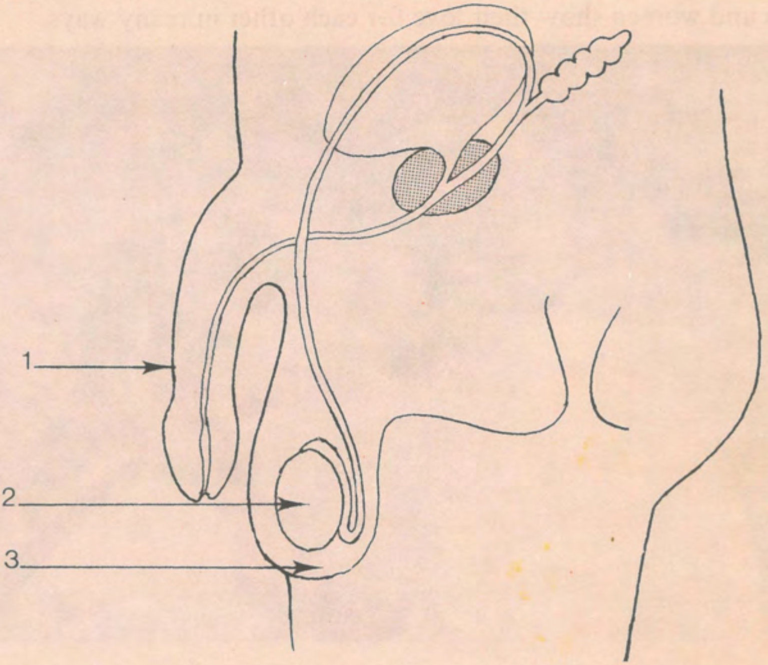
D

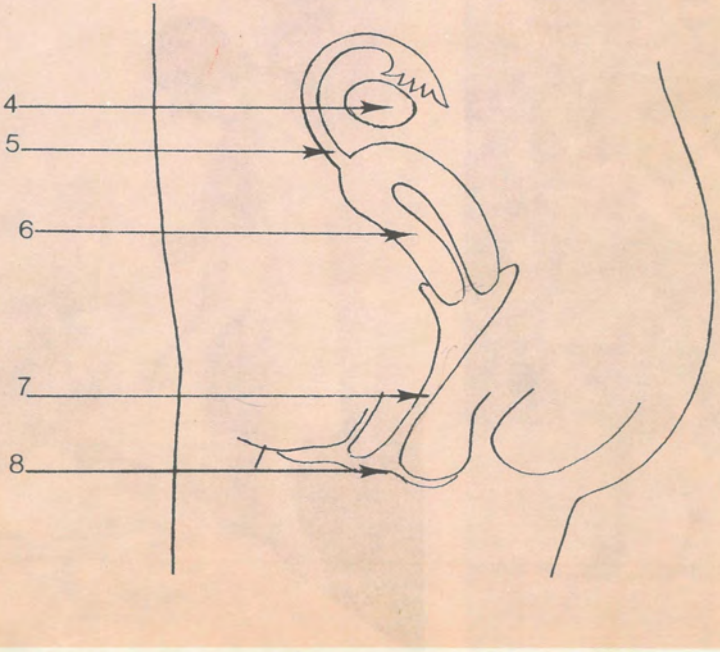
13 List three physical changes which occur when a girl reaches puberty.

14 List three physical changes which occur when a boy reaches puberty.

Now turn to Check Your Answers on page 85 of this book.

Do not write on this page. Use your record book to answer the questions.





Human Reproduction

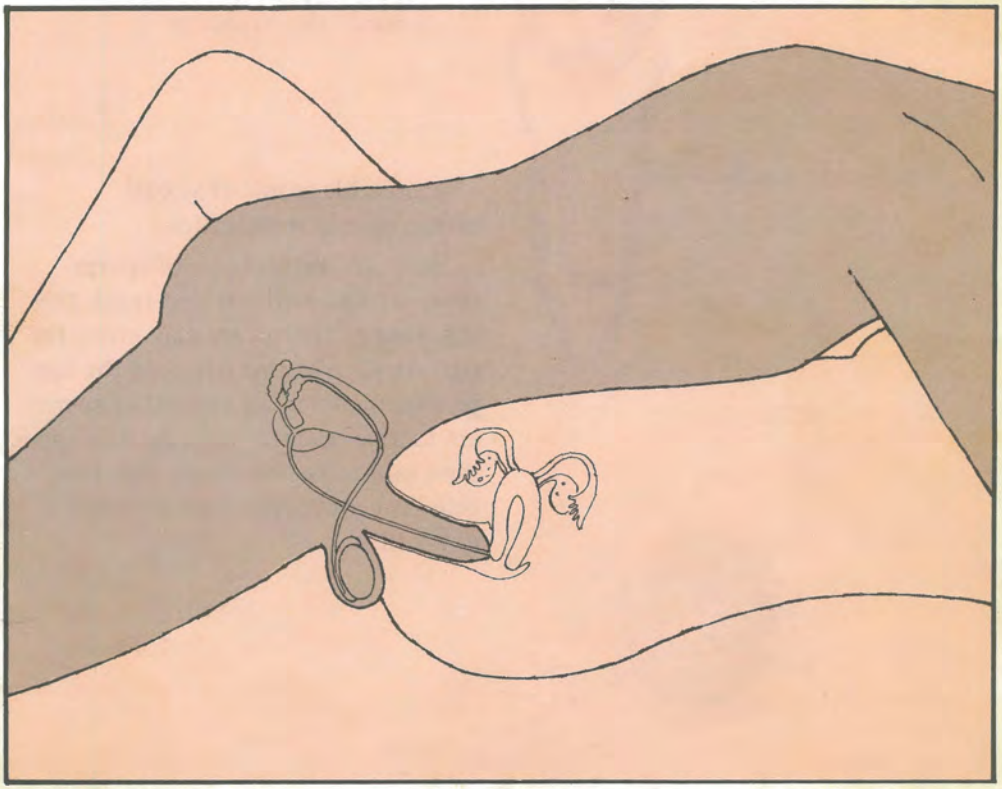
Men and women show their love for each other in many ways.

SEXUAL INTERCOURSE

A man and woman together choose when to express their love for each other by sexual activity which may end in physical union. Another name for this physical union is **sexual intercourse.**

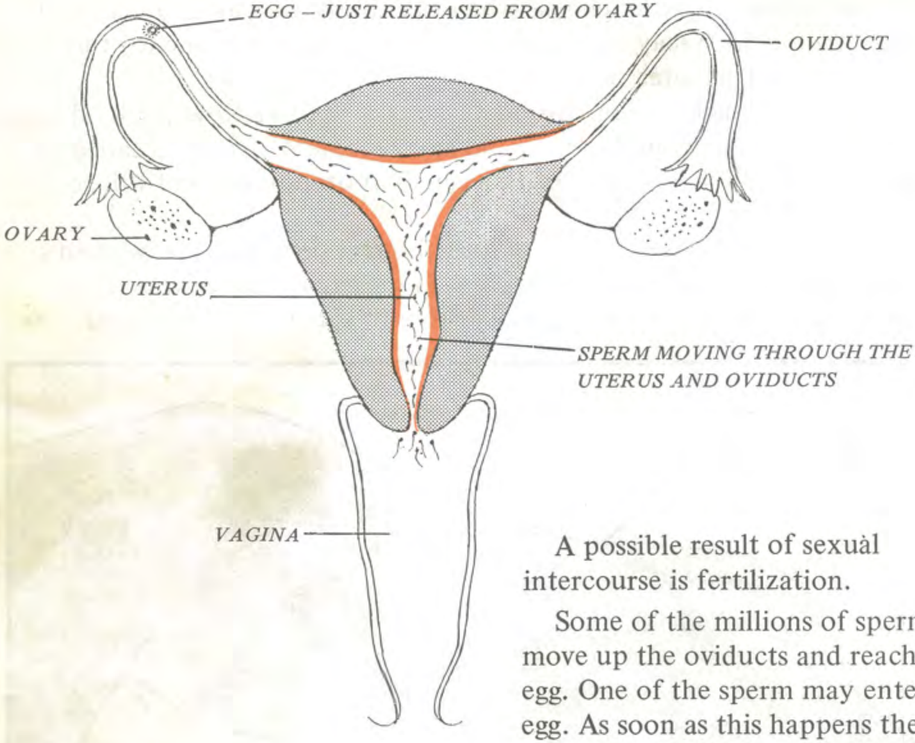
When a man is sexually excited his penis receives an extra flow of blood from the body which causes the penis to expand and become stiff. This is called an erection. (An erection may occur during sleep or at other times and will go down gradually by itself.)

During sexual intercourse the man pushes his erect penis into the woman's vagina (see diagram). Movement of the penis in the vagina causes semen, containing millions of sperm, to be ejected from the penis into the vagina.



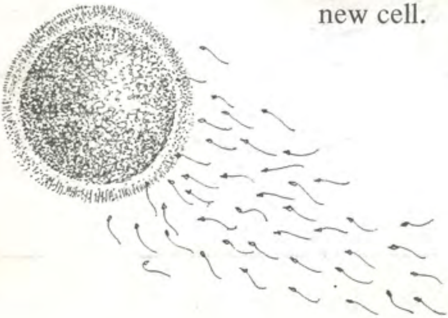
Both men and women may give and receive pleasure during sexual intercourse. People who are sexually mature are able to have intercourse. However, many people in our society believe there are good reasons why men and women should not have intercourse outside marriage.

FERTILIZATION


EGG – JUST RELEASED FROM OVARY
OVIDUCT
OVARY
UTERUS
SPERM MOVING THROUGH THE UTERUS AND OVIDUCTS
VAGINA

A possible result of sexual intercourse is fertilization.

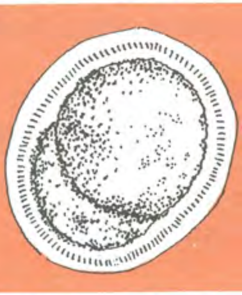
Some of the millions of sperm move up the oviducts and reach the egg. One of the sperm may enter the egg. As soon as this happens the egg produces chemicals and other sperm are unable to enter the egg. The egg is then said to be fertilized. The two cells (egg and sperm) are now one new cell.



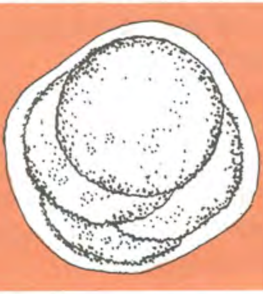
Sperm moving towards an egg, magnified 200 times.

GESTATION

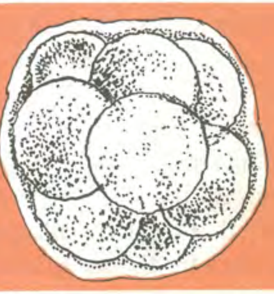
The fertilized egg now begins to develop into a baby. The period of time during which the baby develops in the mother is called **gestation** (about 38 weeks). On its way through the oviduct the new cell begins to divide.



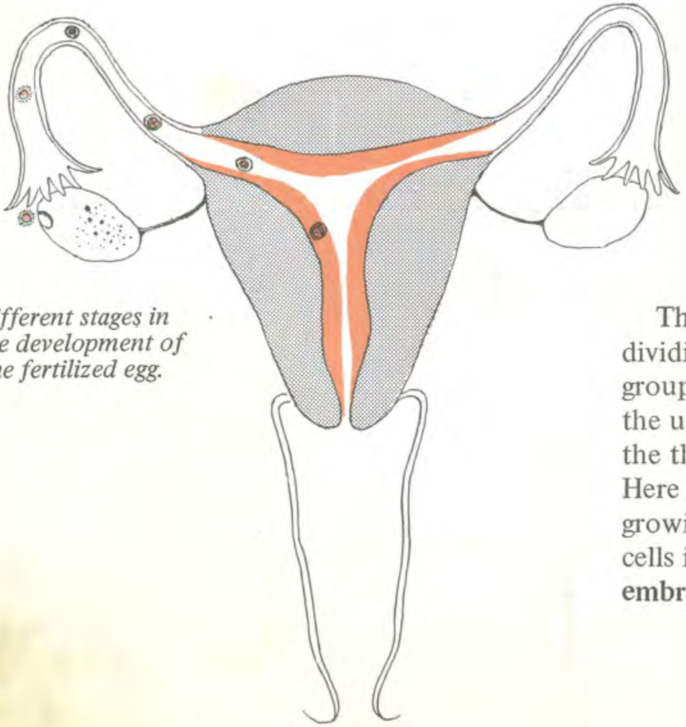
It divides and becomes two cells.



The two cells then divide and become four.



The four cells divide and become eight.



Different stages in the development of one fertilized egg.

The cells keep on dividing. When the group of cells reaches the uterus it sinks into the thickened lining. Here it goes on growing. The group of cells is now called an **embryo** *(EM-bree-oh).*

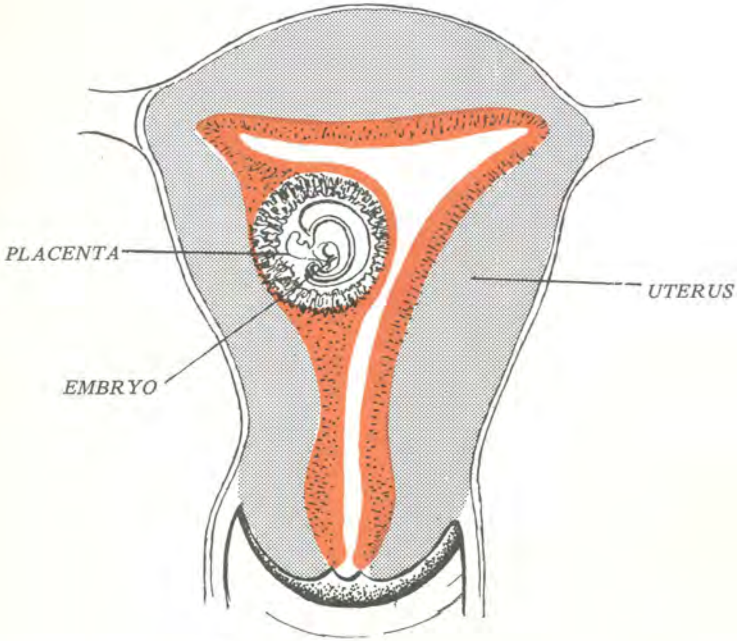
This is how you and everyone else began. The joining of the egg and sperm is called fertilization. In humans it is also called **conception.**

It is possible for a man and women to have intercourse and reduce the chance of conception by using a contraceptive. A contraceptive is anything used to stop fertilization of an egg by a sperm. It is not a simple matter to prevent conception and no method is entirely reliable.

When you were reading about menstruation you saw how the uterus develops a thick lining during one part of the cycle.

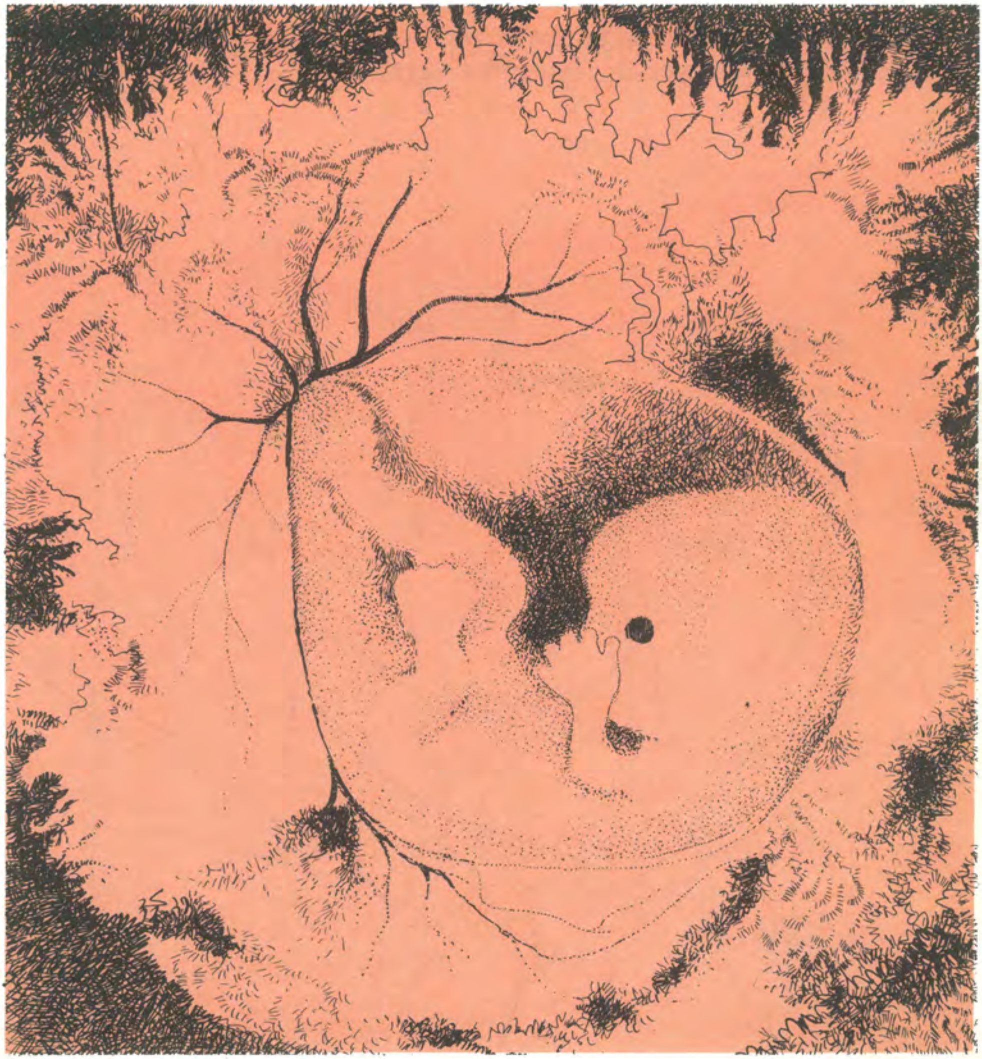
If the egg is joined by a sperm from the male, it sinks into this lining and grows into a baby. The lining remains and is not shed as it is during menstruation The menstrual cycle stops while the baby develops.

Soon after the embryo is in the uterus lining, a mass of blood vessels is formed. This is the **placenta** *(pla-SENT-a).* The embryo is attached to the placenta by the **umbilical cord** *(um-BILL-i-kul).*



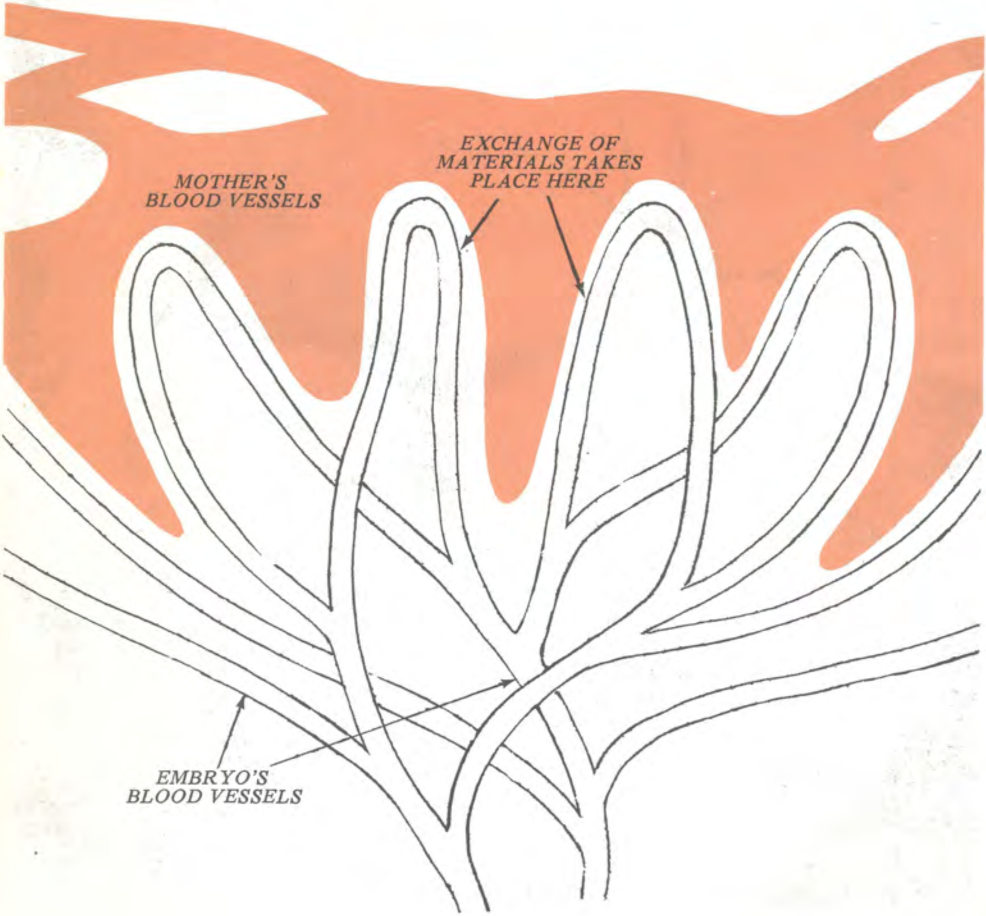
Human embryo
6 weeks old (actual size).

The embryo floats in a sac of liquid which protects it.



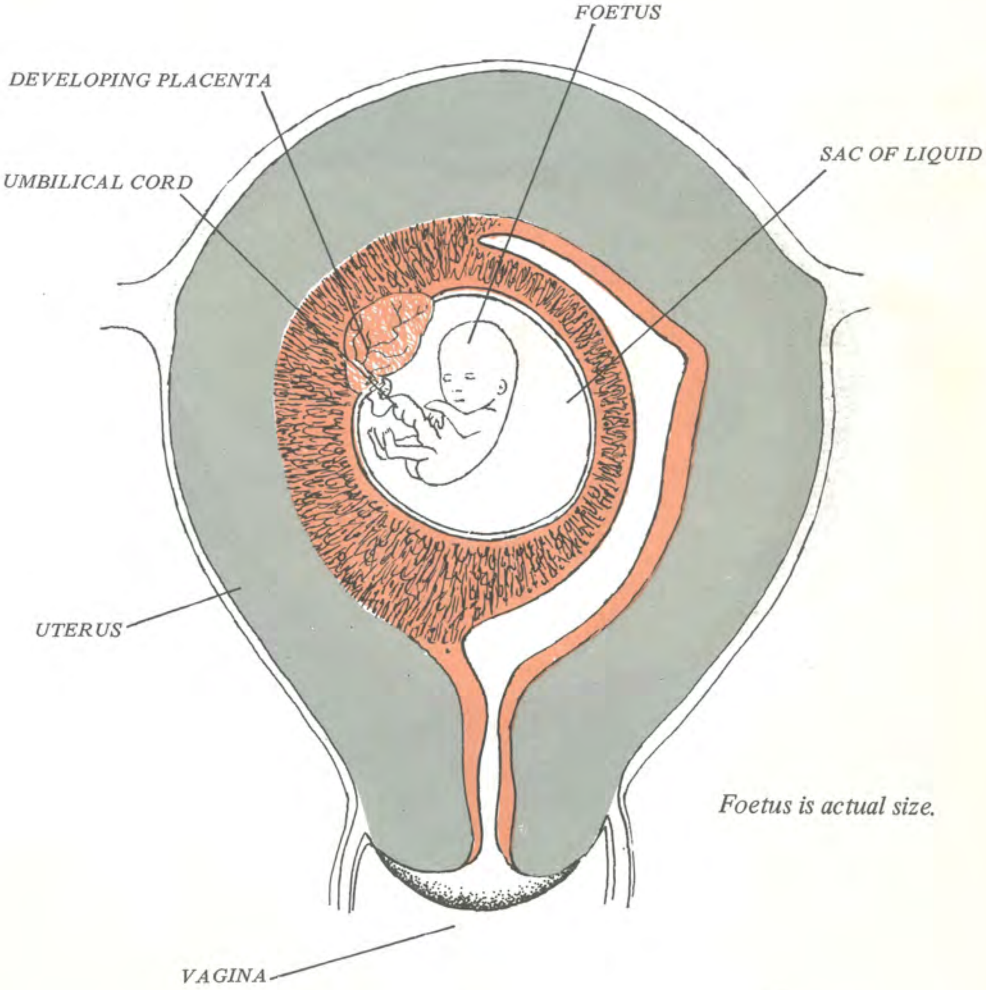
In the placenta the blood of the mother is close to the embryo's blood. But they do not mix. Oxygen passes from the mother's blood to the embryo's blood. Waste products pass from the embryo's blood to the mother's blood and are passed out in the urine of the mother.

This diagram is a greatly magnified view of where the mother's blood vessels and the embryo's blood vessels come close together



Now the embryo is starting to look like a baby, and it is called a **foetus** (*FEET-us*). It is called a foetus until birth.

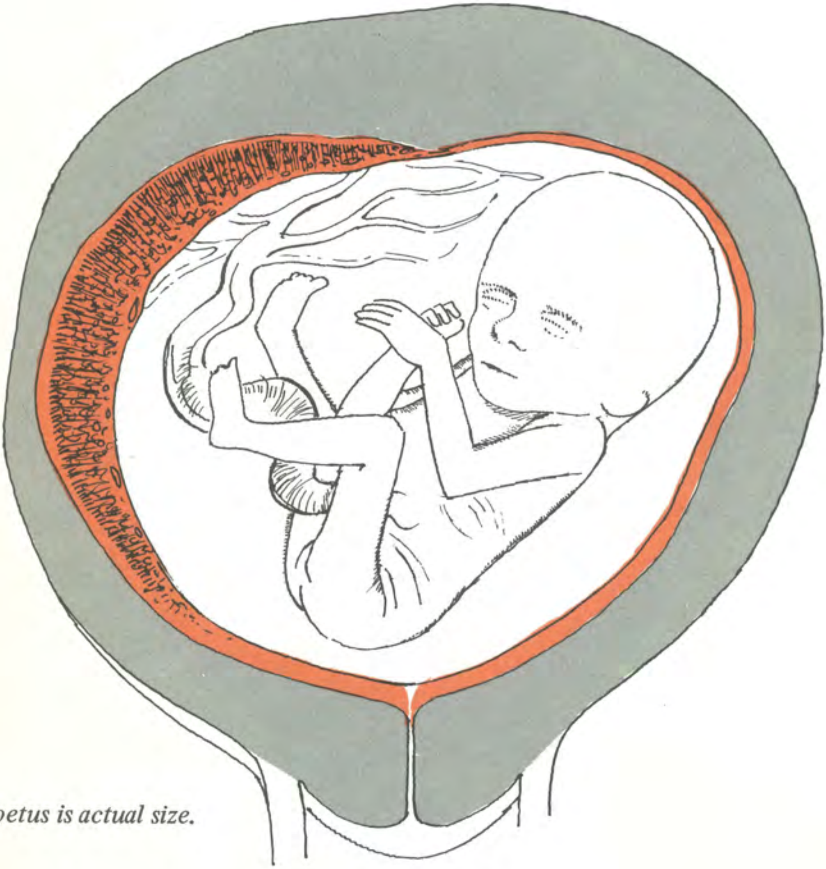
This foetus is 10 weeks old, and is floating in a sac of liquid.



Foetus is actual size.

CAMPBELLTOWN * HIGH SCHOOL *

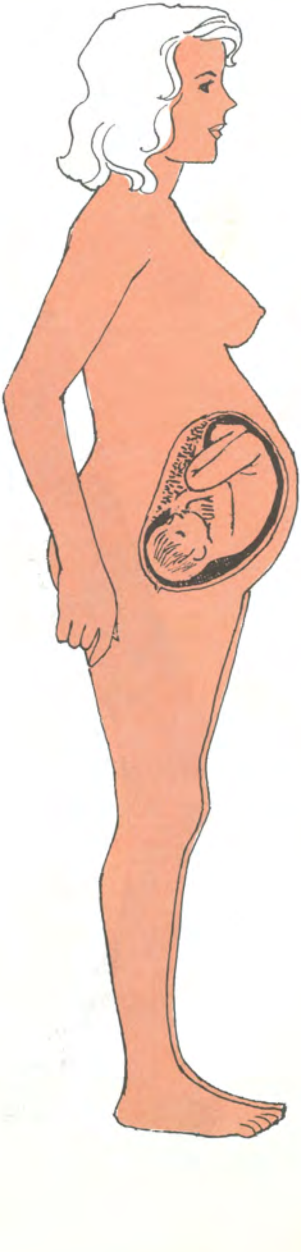
This foetus is 14 weeks old.



Foetus is actual size.

The mother is changing while the foetus is developing. Her body expands as the foetus grows.

The term **pregnant** is used to describe a woman who is going to have a baby.

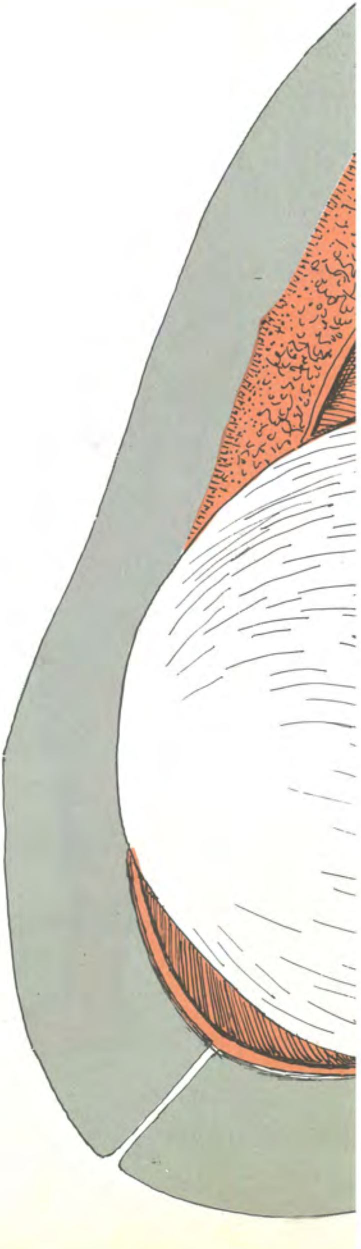


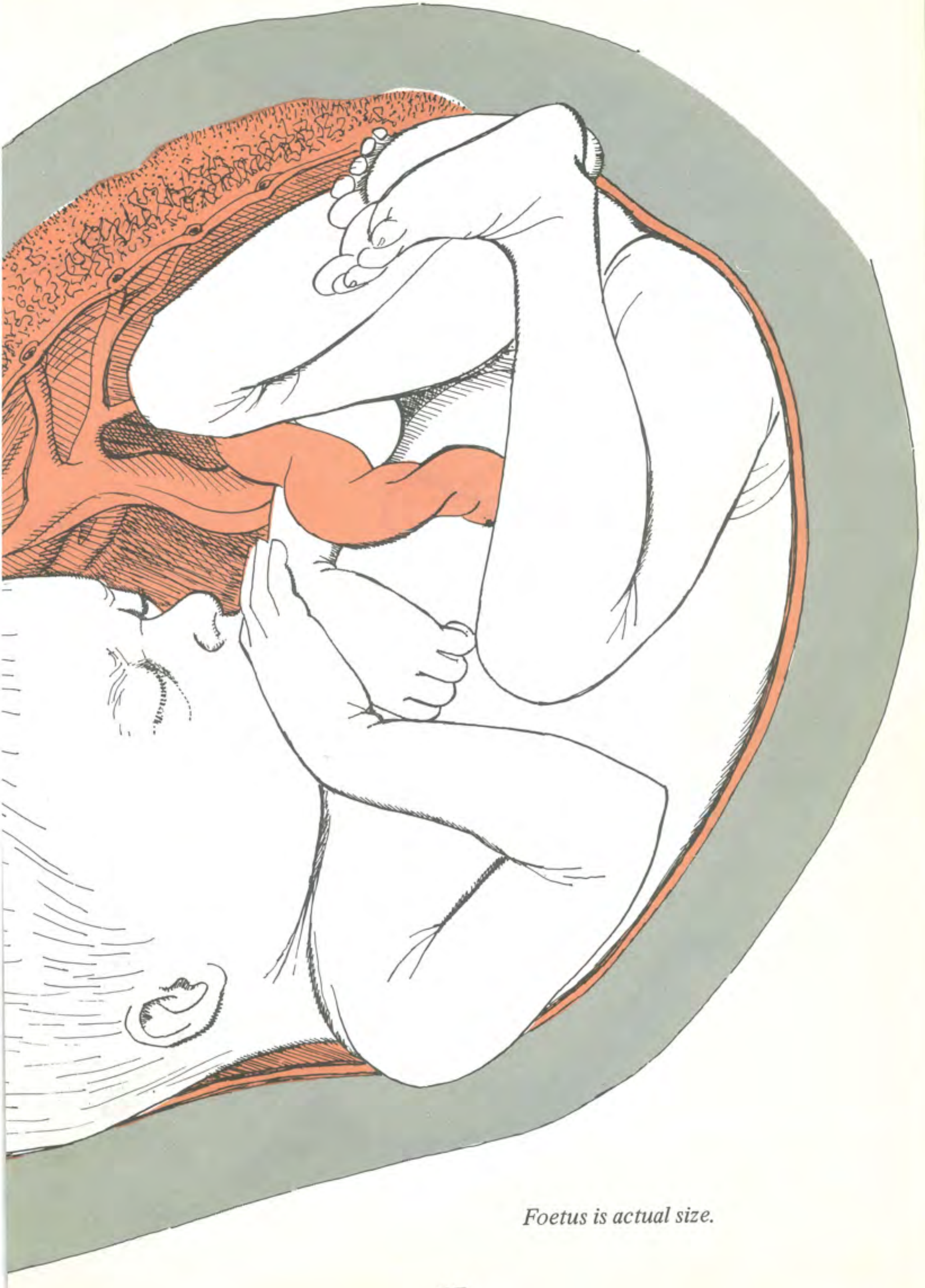
This woman's baby is almost ready to be born.

The foetus is now 24 weeks old. It is still in its sac of liquid. Notice the umbilical cord and the placenta. The foetus can move about in its sac and the mother can feel these movements.

As you can see there is now hair on its head.

Sometimes babies are born early. When this happens, the birth is called a premature birth. Babies born early need extra care in the hospital.



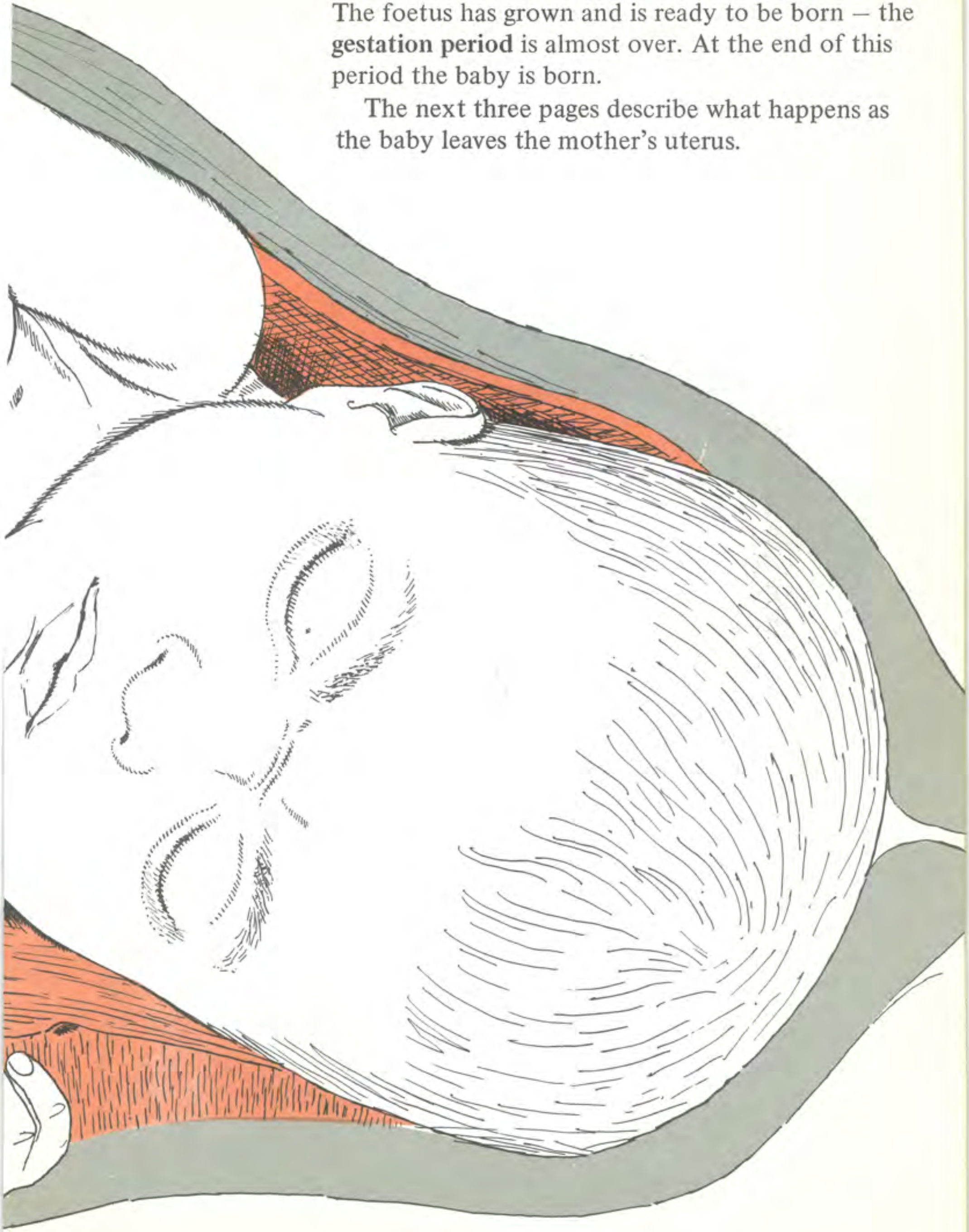


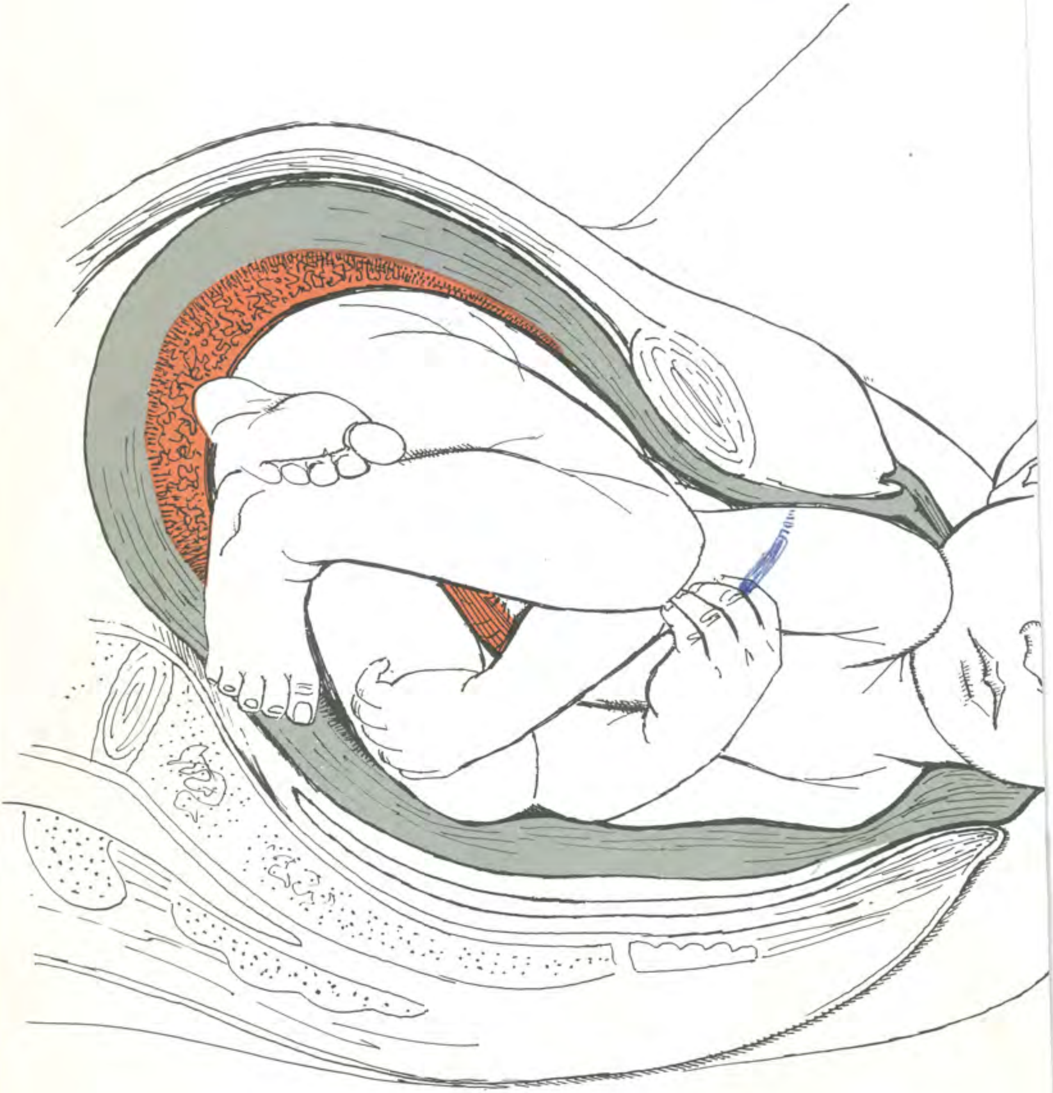
Foetus is actual size.

Foetus is actual size.

About 38 weeks have gone by since fertilization. The foetus has grown and is ready to be born – the **gestation period** is almost over. At the end of this period the baby is born.

The next three pages describe what happens as the baby leaves the mother's uterus.





BIRTH

First, muscles in the mother's uterus begin to squeeze the baby out of the uterus. This process is called **labour.** The sac containing the baby breaks and the liquid drains away. The baby is then pushed out along the vagina. The vagina stretches to allow this.

The umbilical cord is cut and the ends are tied by the doctor. Neither the mother nor the baby feels this. You have a mark called your navel where the cord was attached.

Shortly after the baby is born the placenta follows. This is often called the 'afterbirth'.

After the baby is born its throat and mouth are cleared. (Remember that the baby has been living in a sac of liquid.) The baby then takes its first breath and utters his or her first cry.

The photo at right shows a baby just after birth.

Both parents now have an opportunity to love and care for the new baby.

Try to find out what you weighed when you were born. Also try to find out how long you were. Compare your findings with the rest of the class.

✍ 17 Write what you find out on page 12 of your record book.

The mother's body changes after the baby is born. The woman in the photo is the same woman as on page 35, but now she has had her baby.

After the labour of giving birth she had a feeling of tremendous joy when the baby was born. The father of the baby can share in this joy. Although the father has not been mentioned before in this section on gestation and birth, he has an important role also. He has to care for the mother during this time when she especially needs his love and attention.

✍ 18 Label the diagram of the foetus on page 12 of your record book. Then complete the graph on page 13 of your record book.

What does the graph tell you about the sizes of animals and the gestation periods? You may like to discuss this question with others, and write your findings on page 14 of your record book.

Care From Parents

A new-born baby is quite helpless. The care and attention the baby needs is usually provided by the parents.

A baby's first food is milk. A mother's breasts get larger while she is pregnant. After the birth her breasts provide milk for the baby.

Babies need cuddling and love. Holding the baby during feeding is one way of giving this.

(Photo by courtesy of Nursing Mothers Association.)

It will be about a year before the baby can even stand on its own feet. How do parents care for their children? What do your parents do for you? The care parents give their children changes as the children grow older.

✍ 19 Make lists in the columns on page 15 of your record book of the things parents do for children. You might like to talk about this at home. These are the things you may do as a parent one day.

20 Humans care for their young much longer than any animals do. Try to think why they do this. Write your answers on page 16 of your record book.

(Photo by courtesy of Nursing Mothers Association.)

21 If you have the chance to visit a home where there is a young baby, you can see how parents care for their babies. You can write what you find out on page 16 of your record book.

A student interviewing parents who have young children.

Social Behaviour

Social behaviour is the way in which people behave when they are together. Each person's behaviour is affected by how he is treated by others which, in turn, affects the way he treats others.

Form a group and discuss whether or not you think there are differences in the social behaviour of males and females. You may want to use some of the questions on this and the next page to begin your discussion.

Are there social responsibilities for boys and girls in their behaviour towards each other? For example:

☐ In what ways (if any) are boys expected to show courtesy to girls?

☐ How do girls show respect for boys?

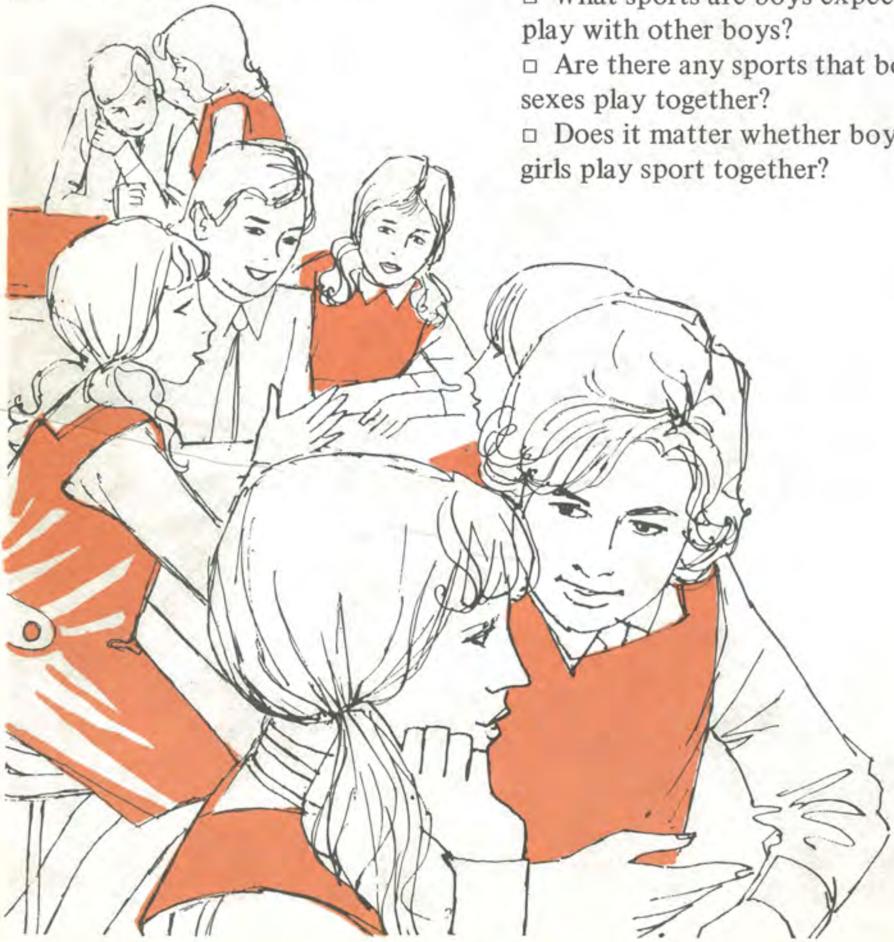
☐ How do boys show respect for girls?

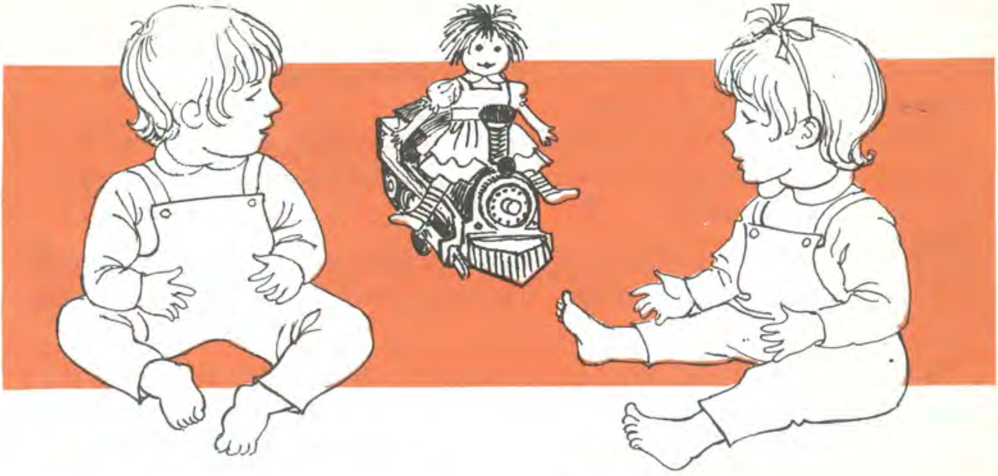
☐ What sports are girls expected to play with other girls?

☐ What sports are boys expected to play with other boys?

☐ Are there any sports that both sexes play together?

☐ Does it matter whether boys and girls play sport together?





After a baby is born it needs to be clothed. What colours are used for a baby girl's clothes? Are different colours used for a baby boy's clothes? Do you think a difference is necessary? Is it useful?

As babies grow older, they may be given different toys to play with. But does it matter if a girl plays with cars? Does it matter if a boy plays with dolls?

Children are usually dressed differently according to their sex. Do you think this is necessary? Why or why not?

When children start school they may be taught many rules based on their sex. For example, they must use different toilets, and sometimes they must play in different areas. Do you think rules like these are necessary? Why or why not?

When a couple become parents what are they expected to do? Are there any things that mothers do that fathers do not do? Are there any things that fathers do that mothers do not do?

In our society, are there jobs that

☐ usually only women do?
☐ usually only men do?
☐ only women can do?
☐ only men can do?
☐ both men and women do?

Do you think the social behaviour of men and women is changing?

✍ 22 In the first column on page 17 of your record book, list some of the differences in the social behaviour of men and women. List some of the similarities in the social behaviour of men and women in the second column.

CAMPBELLTOWN HIGH SCHOOL

In our society, as in all other societies, there are many established practices in social behaviour. Many of these practices were begun by earlier generations. Many have arisen from a person's respect for other people and his or her recognition of their social needs.

In all our social behaviour, including sexual behaviour, one 'rule' that is valued greatly in our society is that of treating other people as you would like to be treated yourself.

23 Read through the list that you have made on page 17 of your record book. Tick (✓) those kinds of behaviour which you think have arisen from people's respect for each other.

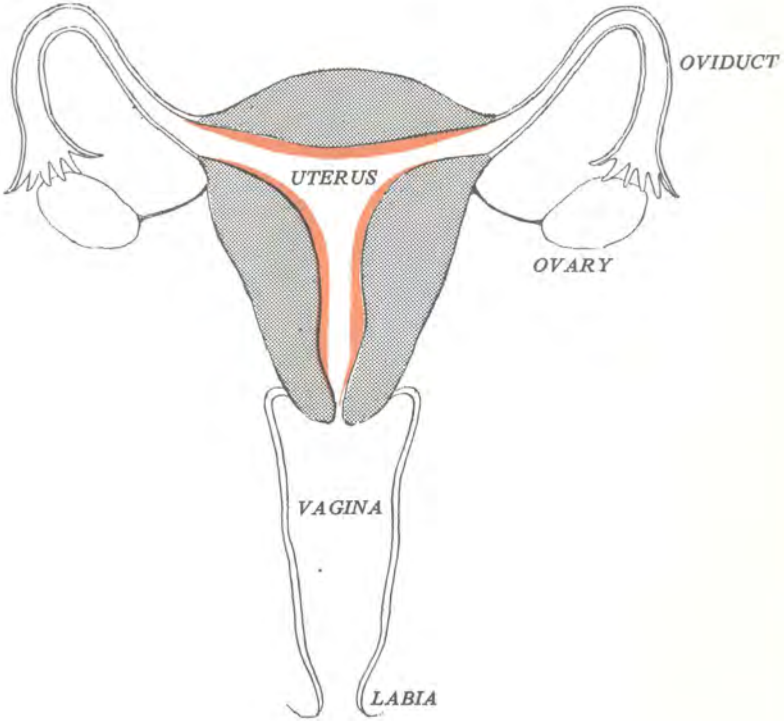
Discuss with other students kinds of behaviour that could be added to the list. Choose some examples of behaviour that teenagers would use amongst themselves to show respect for each other. Add them to the list.

TEST YOURSELF (Part Two)

This test is to help you find out if you understand what you have been doing. It is not a test for marks. For some questions, you have to choose the best answer from the several answers suggested. In each of these cases, write on page 18 of your record book only the letter of the answer which you choose.

It is important that all your answers are your own work.

Questions 1–4 refer to this diagram of the female reproductive system.

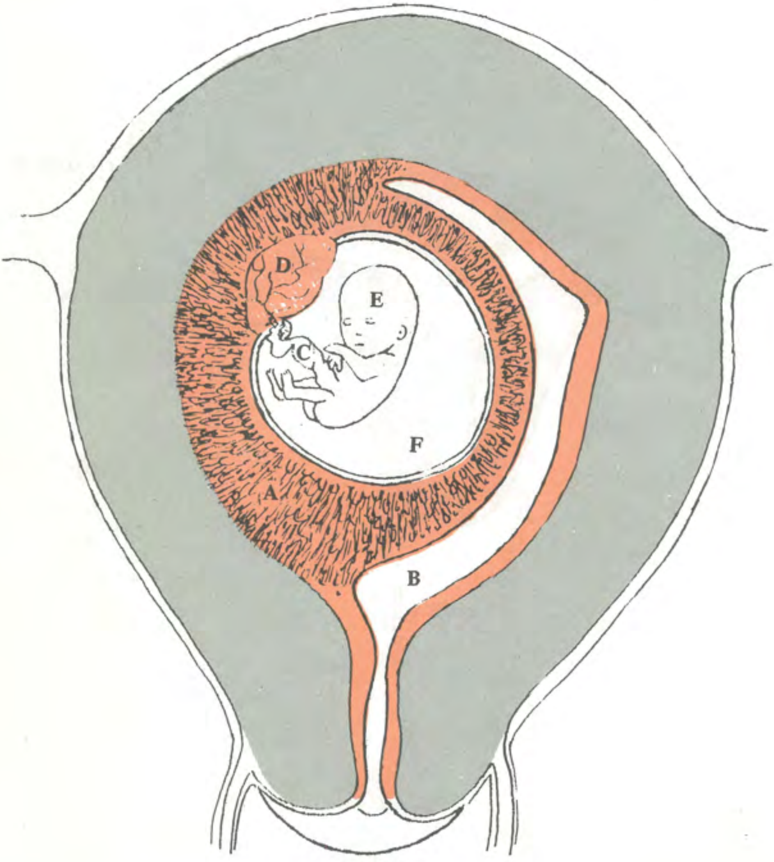


Write down the word which indicates where

1 the eggs are produced.
2 the penis normally deposits sperm.
3 fertilization usually occurs.
4 a fertilized egg eventually comes to rest.

Test Yourself continued next page

Questions 5–8 refer to this diagram of a foetus developing in the uterus.



VAGINA

5 Which letter represents the placenta?

6 Which letter represents the sac of liquid?

7 Which letter represents the foetus?

8 Which letter represents the umbilical cord?

9 The main function of the placenta is to

- A protect the baby.
- B provide food and oxygen for the baby.
- C form the heart and blood vessels of the baby.
- D get rid of the blood normally lost by the woman during menstruation.

10 The length of time during which the baby develops within the mother is called the gestation period. In humans this is normally about

- A 4 weeks.
- B 10 weeks.
- C 24 weeks.
- D 38 weeks.
- E 52 weeks.

11 One function of the testes is to

- A produce egg cells.
- B store urine.
- C produce sperm cells.
- D supply blood to the penis during an erection.

12 The thickness of the lining of a woman's uterus changes during the menstrual cycle. The lining is thickest

- A just after menstruation.
- B when an egg is released.
- C just before menstruation.
- D during menstruation.
- E during pregnancy.

13 In the process of birth the baby passes from the uterus to the outside world through the woman's . . . .

14 Recently some researchers in the United States studied the behaviour of children in some orphanages. They compared children who were brought up in certain orphanages with other orphans who were adopted and brought up in normal homes. It was found that the children brought up in the orphanages were generally more aggressive than the other children. They showed their aggression by telling lies, destroying things and hitting other children.

What do you think might have been a reason for this aggression?

Now turn to Check Your Answers on page 86 of this book.

ABOUT THE OPTIONS

You can make a choice from these options. You may use library books, encyclopaedias, magazines and books at home to help you. Television and films that you see, as well as discussions with other people, may also be helpful.

It is not necessary for everyone in your class to do all of the options. You can find out some things and others can find out other things. It is important that you share what you find out with the whole class. You can do this by writing a report about your findings and telling the class what you find out. Pictures and drawings will help you explain your report to the class.

OPTION 1:
CHICKENS AND EGGS . . Page 56

You incubate eggs and look at the developing embryos.

OPTION 2:
INSIDE A MAMMAL . . . . Page 64

You can dissect mammals, e.g. rats or mice, and look at the reproductive organs.

OPTION 3:
FLOWERS . . . . Page 65

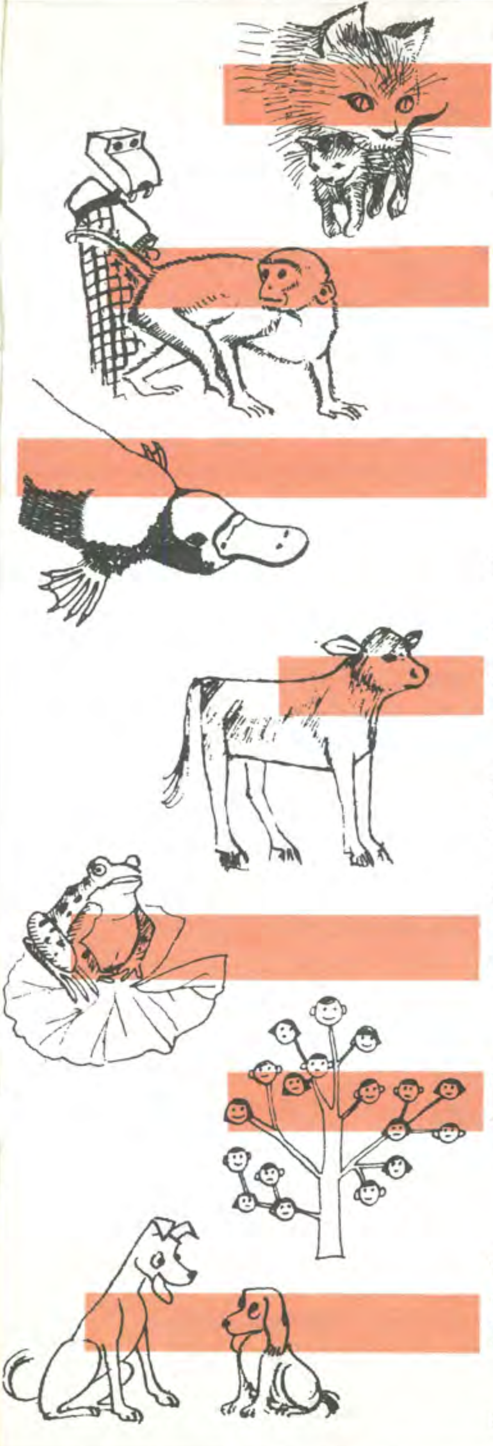
You look at the structure of a flower and how it reproduces.

OPTION 4:
FLIES . . . . Page 70

If you do this activity, you can watch the life cycle of a fly.

OPTION 5:
TWINS . . . . Page 72

You can find out how twins are formed.



OPTION 6:
HOW ANIMALS CARE FOR THEIR YOUNG .... Page 74

You find examples of the way animals care for their young.

OPTION 7:
WIRE MOTHERS ...... Page 76

An interesting experiment about baby monkeys is described to you.

OPTION 8:
EGG LAYERS .... Page 78

You find names of animals that hatch from eggs.

OPTION 9:
ARTIFICIAL INSEMINATION .... Page 80

You can find out how cows can have calves without the presence of a bull.

OPTION 10:
TADPOLES AND FROGS .... Page 81

You look at the life cycle of a frog.

OPTION 11:
A FAMILY TREE ...... Page 82

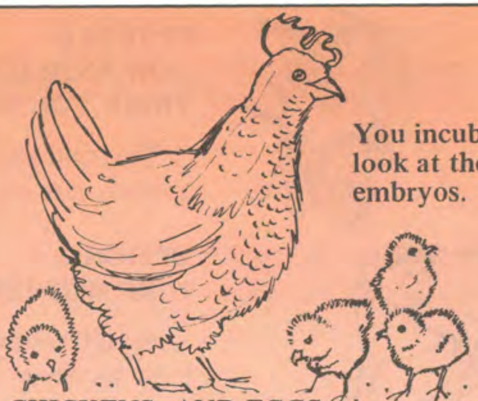
You make your own family tree.

OPTION 12:
COURTSHIP BEHAVIOUR IN ANIMALS .... Page 83

You can find out how animals attract their mates.

OPTION 1

CHICKENS AND EGGS



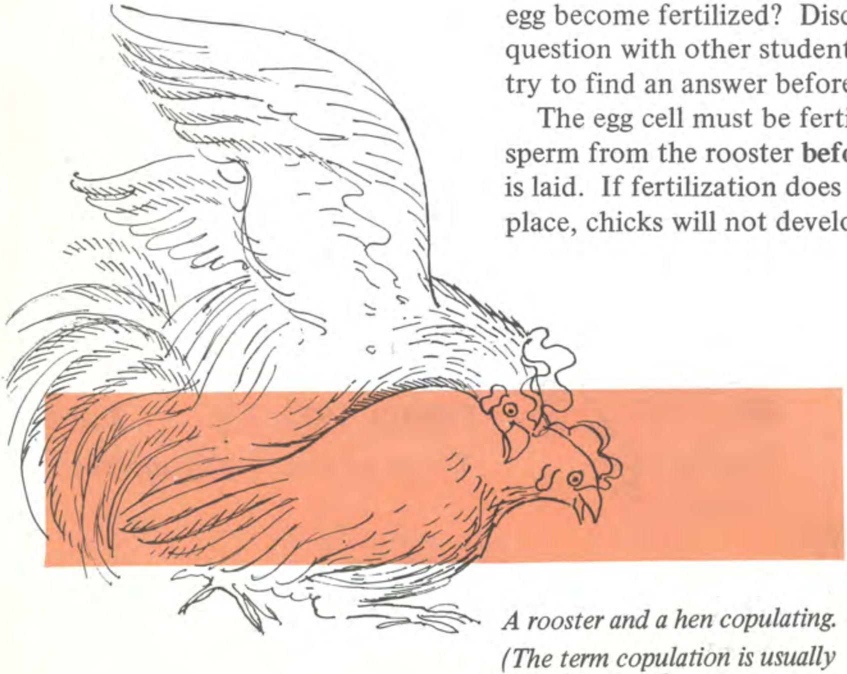
You incubate eggs and look at the developing embryos.

FERTILIZATION

In humans and most other mammals the embryo develops **internally**–inside the mother's body. In birds it develops **externally**–outside the mother's body in an egg.

How does the egg cell inside the egg become fertilized? Discuss this question with other students and try to find an answer before going on.

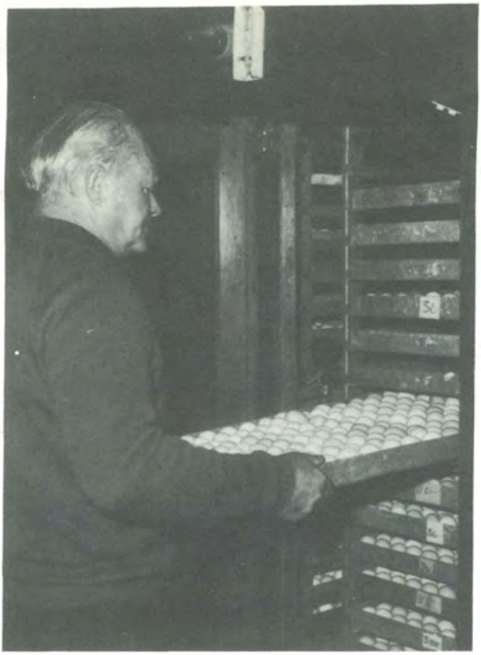
The egg cell must be fertilized by sperm from the rooster **before** the egg is laid. If fertilization does not take place, chicks will not develop.



A rooster and a hen copulating.

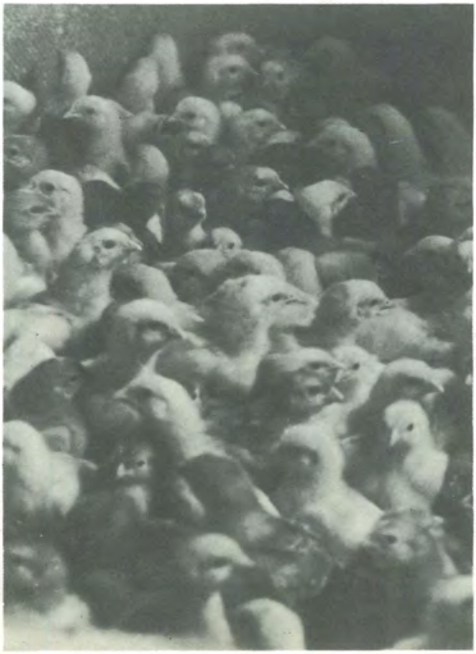
(The term copulation is usually used for animals.
The term sexual intercourse is usually used for humans.)

Fertilized eggs are hatched in large numbers in chicken hatcheries.

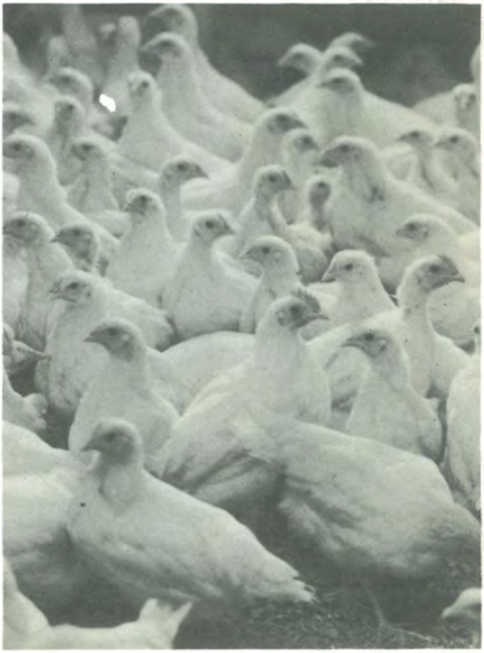


Fertilized eggs being placed in incubator.

One-day-old chicks.



One-week-old chicks.



Seven-week-old chicks.

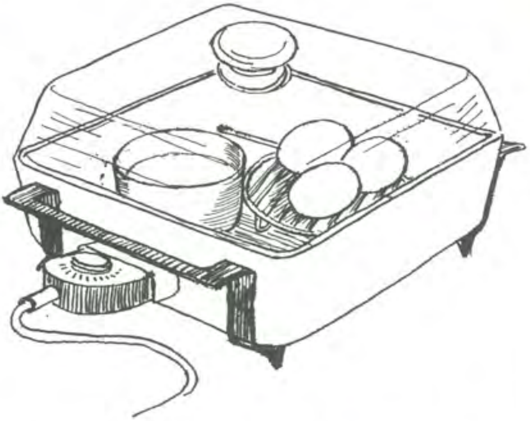
(Photos by courtesy of Pettigrove's Hatchery, Blackburn, Vic.)

INCUBATION

You may now like to try hatching some eggs. You may work in a group.

Each group will need:

- 4 fertilized eggs (obtainable from a chicken hatchery)
- an incubator (set at 38 ℃)
- 2 bowls (large enough to hold the egg contents)
- 1 bottle of saline solution–9 g of sodium chloride (table salt) dissolved in 1 litre of water
- 1 Celsius thermometer
- 1 ruler
- paper to pack around an egg
- tweezers to break the shell
- hand lens.

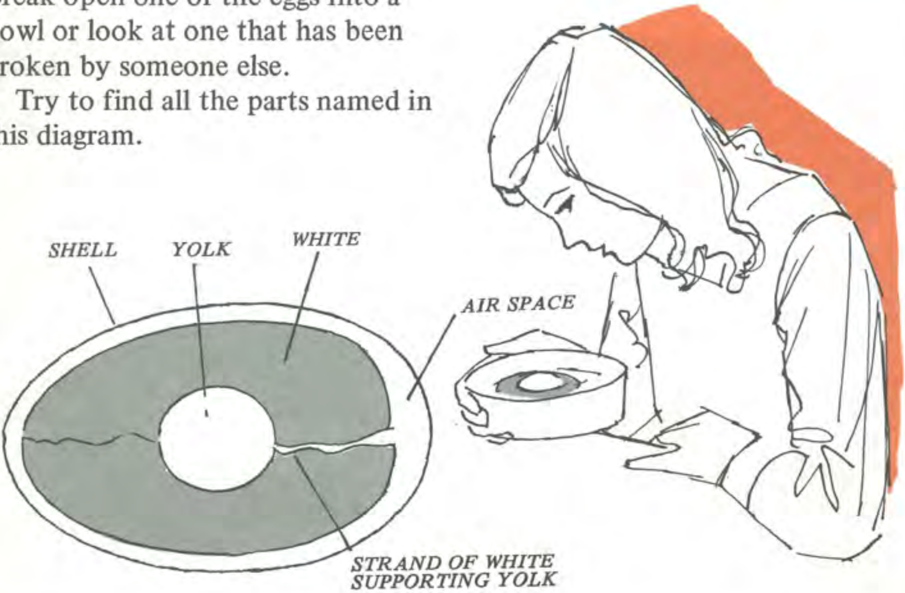


An electric frying pan may be used as an incubator. A thermometer and a dish of water can be placed in the pan.

Your school may have an incubator that you can use. If not, then the diagram at right shows another way of incubating the eggs.

Break open one of the eggs into a bowl or look at one that has been broken by someone else.

Try to find all the parts named in this diagram.



Now place the other eggs in the incubator. If you are sharing the incubator with others, mark your eggs clearly with a pencil.

A hen sitting on eggs keeps them warm and turns them several times a day. She keeps them damp with the moisture from her body. These three things help the embryos to develop.

You must look after the eggs as well as a hen does.

To do this you will need to:

1 Keep the incubator set at 38°C. It can drop a little below this (1°C or 2°C) but must not go above or the chickens will die.

2 Turn the eggs twice a day. (Before school and after school may be suitable times.) Roll the egg sideways. Wash your hands before and after handling the eggs.

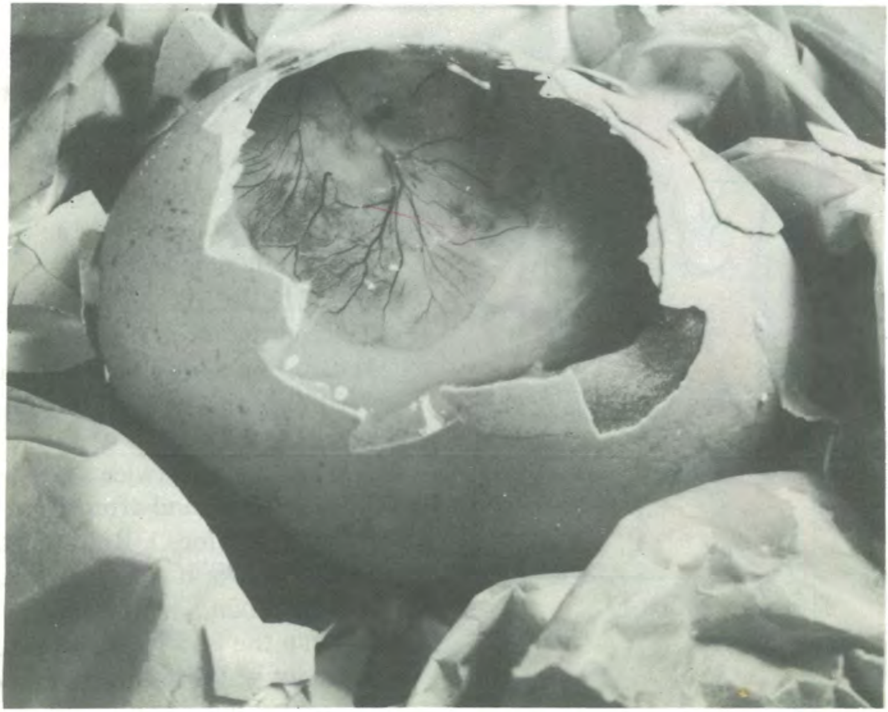
3 Keep the eggs moist by placing a dish of water in the bottom of the incubator.

LOOKING AT EMBRYOS

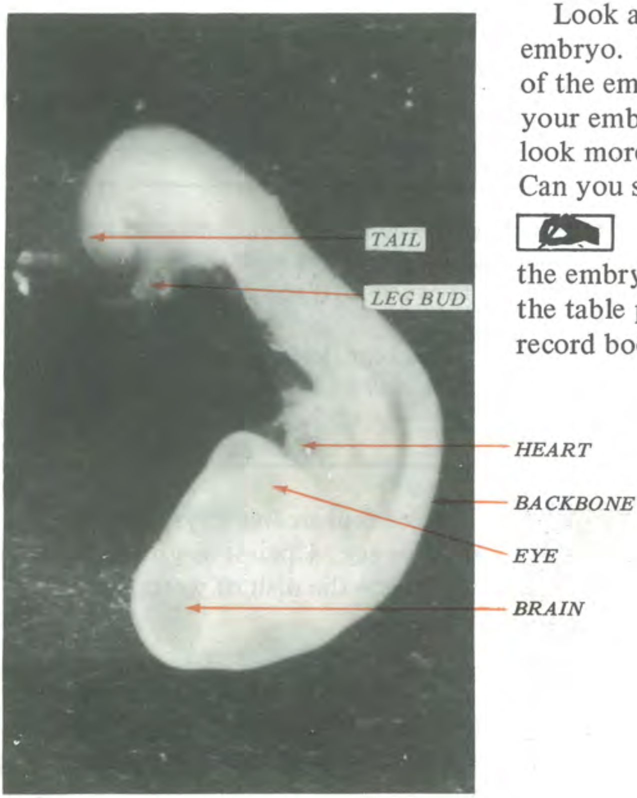
After two or three days take one egg from the incubator. **Keep it facing up the same way.**

Put the egg in a bowl packed with paper.

Break the shell with forceps. Remove the small pieces and make a window into the egg. Remove more of the shell.



Carefully remove the embryo and put it in a flat dish containing warm saline (salt) solution (38 °C). The bottle of saline solution could be kept warm in the incubator.

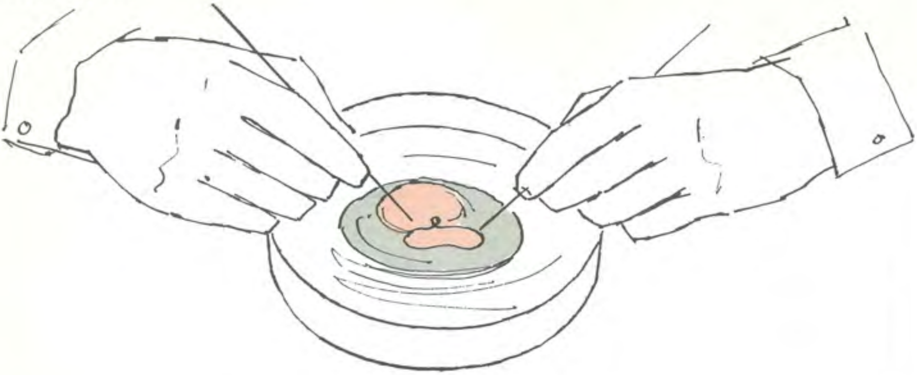


A chicken embryo after 3 days, magnified about 10 times.

Look at the photo of the three-day embryo. Compare the named parts of the embryo in the photo with your embryo. Use a hand lens to look more closely at the embryo. Can you see the heart beating?

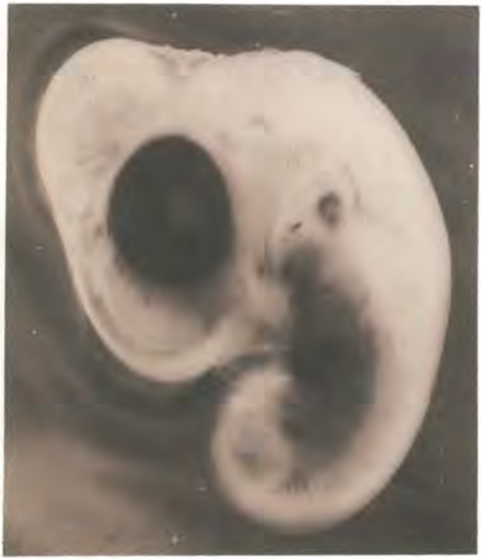
✍ 1.1 Each time you look at the embryo, write your observations in the table provided on page 19 of your record book.

Measure the length of your embryo. You will have to straighten it to measure it.



You may wish to preserve the embryo. To do this you will need a small jar with a lid and some 70 per cent alcohol. (This can be made by mixing 70 millilitres of alcohol with 30 millilitres of water.) If you do not have alcohol, you could use methylated spirit.

Place the embryo in the jar with the 70 per cent alcohol. Put a lid on the jar. After two days pour out the alcohol. Add fresh 70 per cent alcohol. This will preserve the embryo.



A chicken embryo after 5 days, magnified about 6 times.

After four or five days remove another egg. Open it as you did before. Move it to the dish of warm saline solution.

Has the yolk changed?

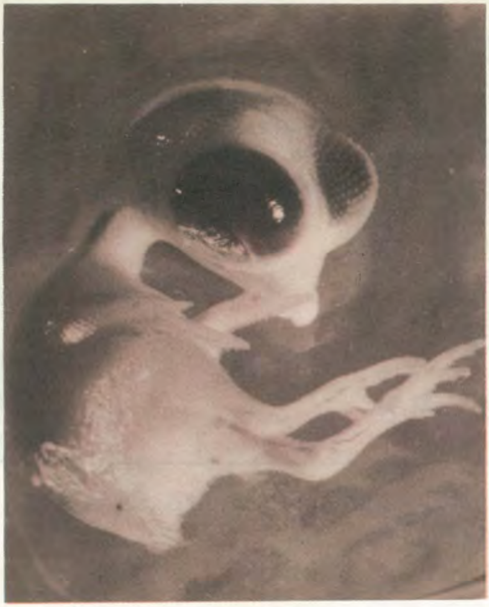
Can you see the blood moving in the blood vessels on the yolk?

Have the wings and leg buds grown bigger?

Does the embryo have a beak?

Measure the length of the embryo. Write what you see in your table on page 19 of your record book.

If you wish to preserve this embryo, use 70 per cent alcohol again.



A chicken embryo after 7 days, magnified about 2.5 times.

A chicken hatching.

After seven or eight days look at another embryo. Can you see any new parts that were not present in the five-day embryo? Can you see toes?

Measure the embryo. Write what you see in your table.

Use 70 per cent alcohol if you want to keep the embryo.

Leave the last egg in the incubator. Keep turning it twice a day and keep the temperature at 38 °C.

THE HATCHING

The chickens should start to come out on the twenty-first day. If you can, watch this hatching.

✍ 1.2 Write what you see during this hatching in your record book. You should now have a record of the **development** of a chicken embryo.

✍ 1.3 Discuss the following questions with some other students and write your answers in your record book.

☐ What are the names of some other animals that hatch from eggs?

☐ What animals are born from their mother's body?

☐ Do any mammals lay eggs? Try to name them. Where do they occur naturally?

☐ In what ways is the development of a chicken similar to the development of a human baby? What differences are there?

OPTION 2

You can dissect mammals, e.g. rats or mice, and look at the reproductive organs.

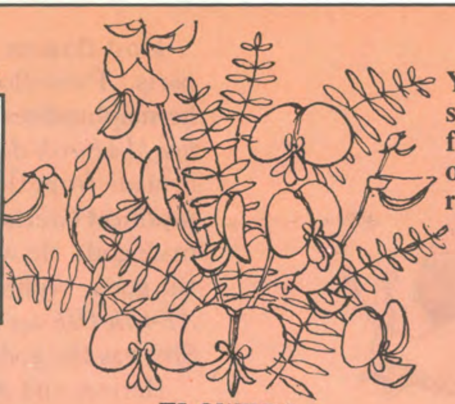
INSIDE A MAMMAL

The film on dissection of the reproductive system in rats and the set of wall charts will show you how to do the dissection.

2.1 You can draw what you see on pages 21 and 22 of your record book.

OPTION

3



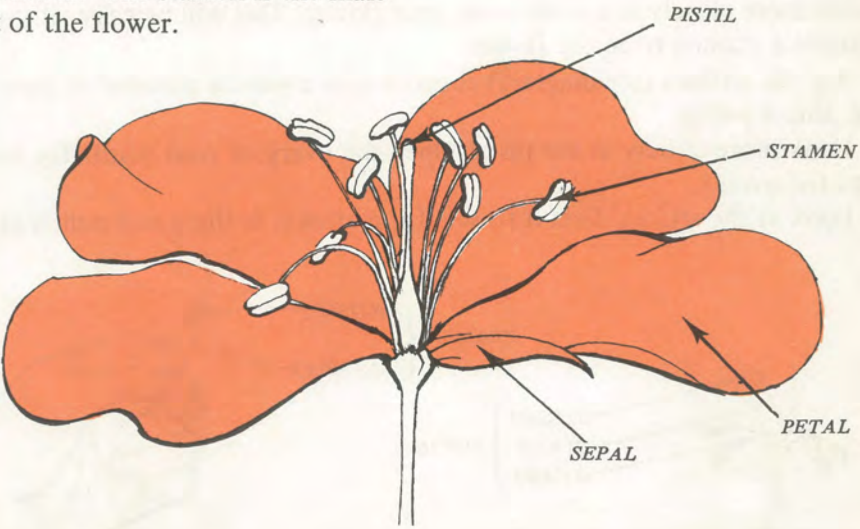
You look at the structure of a flower and find out how it reproduces.

FLOWERS

You will need:

- 1 flower (e.g. geranium, fuchsia)
- 1 microscope
- 1 microscope slide
- 3 or 4 different fruits (e.g. tomato, orange, grape)
- 1 hand lens.

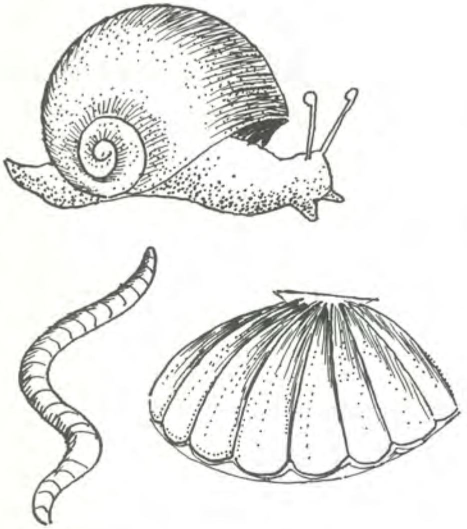
Look at the parts named on this diagram. Find these parts on your flower. The **pistil** (or carpel) is the **female** part of the flower. The **stamen** is the **male** part of the flower.



Most flowers have male and female parts. These flowers are called **hermaphrodites** (pronounced *her-MAF-roh-dite).* This long word is made from the names of two mythical Greek gods. **Hermes** was a male god. He was the messenger of the gods. **Aphrodite** (pronounced *AF-roh-DIE-tee)* was a female goddess. She was the goddess of beauty.

Hermes and Aphrodite had a son called **Hermaphroditus**. A nymph grabbed him and pleaded with the gods. 'May he never be separated from me'. The gods granted her plea. They fused the nymph and Hermaphroditus into one body–male and female in one.

Hermaphrodite means being male and female at the same time.



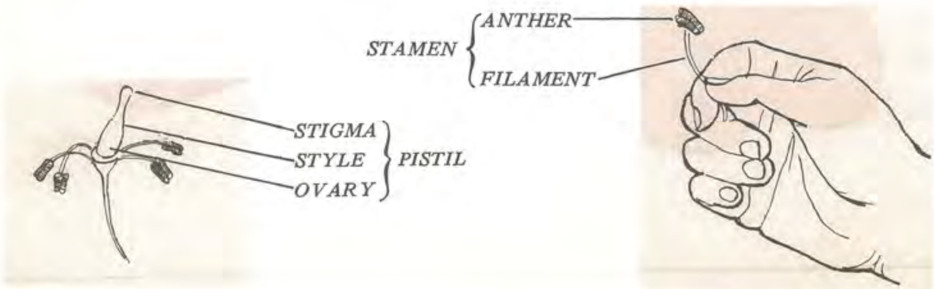
These animals are hermaphrodites.

Look more closely at a stamen on your flower. This will be easier if you remove a stamen from the flower.

Are the anthers (see diagram) covered with a yellow powder? If they are, this is pollen.

Look more closely at the pistil. Open the ovary of your pistil. Try to find the ovules.

Look at the stigma. Feel it to see if it is sticky. Is there any pollen on it?

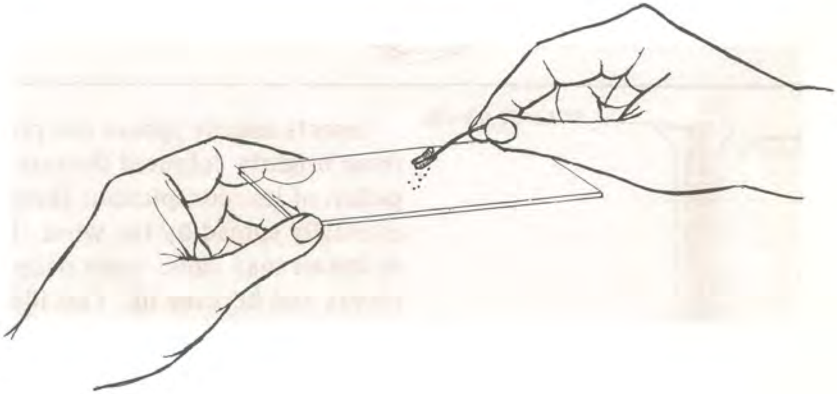


✍ 3.1 How do you think pollen could get from an anther to a stigma? Write your answer in your record book on page 23.

✍ 3.2 How could the pollen be carried from one flower to another?

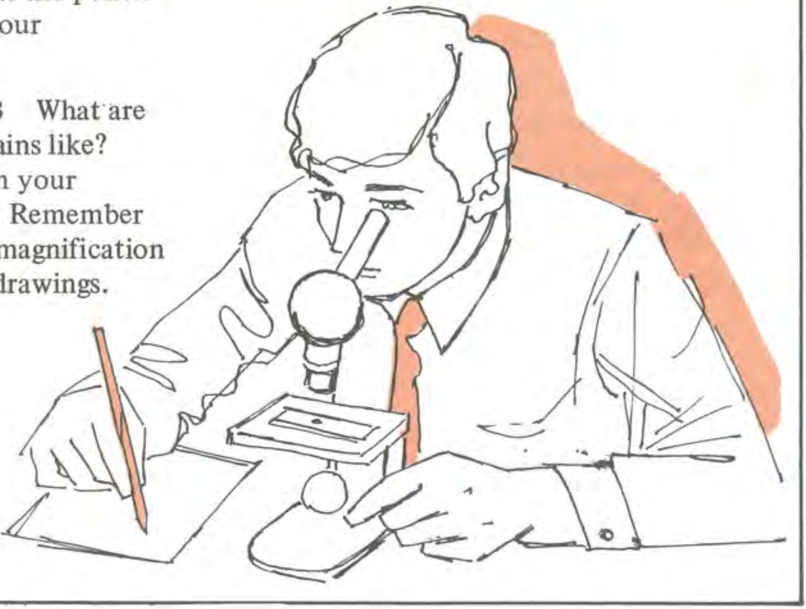
Now you will need to use a microscope. If you don't know how, look at ASEP's *Using a Microscope* before going on.

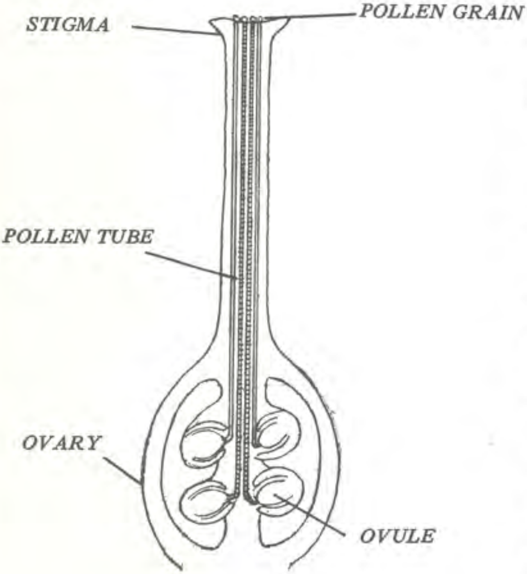
Sprinkle some pollen on a microscope slide. Do not add water.



Put a coverslip on your slide. Look at the pollen grains with your microscope.

✍ 3.3 What are the pollen grains like? Draw some in your record book. Remember to write the magnification beside your drawings.





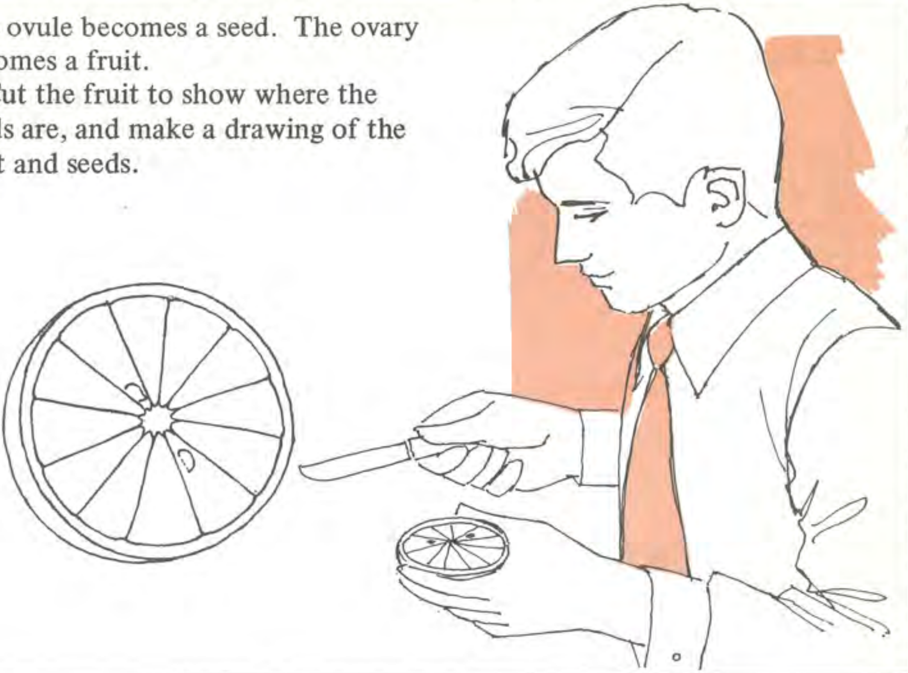
Insects usually spread the pollen from brightly coloured flowers. The pollen of less conspicuous flowers is usually spread by the wind. Pollen in the air may cause some people to sneeze and become ill. This illness is called hay fever.

The pollen grain has two sperm cells in it. After the pollen grain lands on the stigma the pollen grain grows a tube. The sperm cells move down the tube and into an ovule. One sperm cell fertilizes the egg cell in the ovule.

As in humans, once one sperm has fertilized the egg cell others cannot get in. The second sperm cell fuses with other cells in the ovule and makes a food supply for the growing embryo.

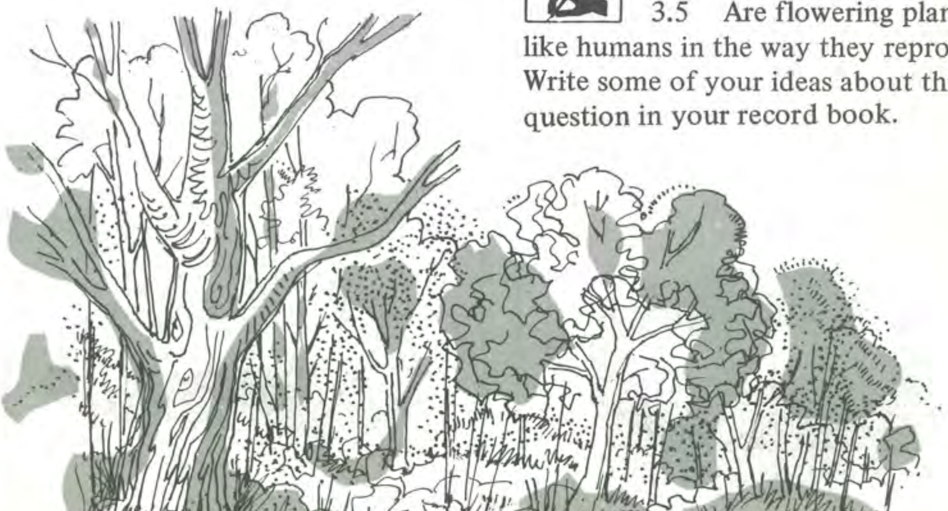
The ovule becomes a seed. The ovary becomes a fruit.

Cut the fruit to show where the seeds are, and make a drawing of the fruit and seeds.



3.4 What may happen if you plant the seeds?

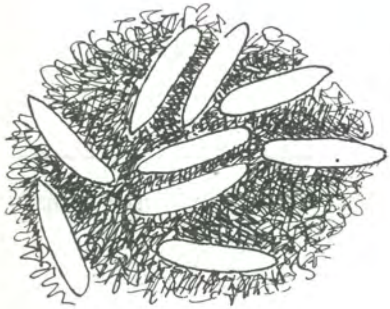
3.5 Are flowering plants like humans in the way they reproduce? Write some of your ideas about this question in your record book.



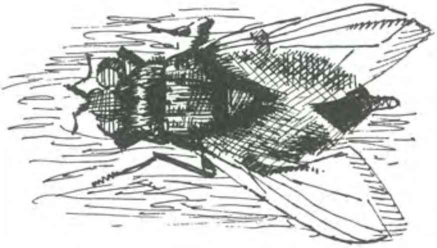
OPTION 4

If you do this option, you can watch the life cycle of a fly. You will need to do this in summer when there are plenty of flies around.

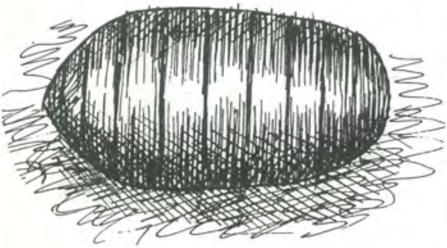
FLIES



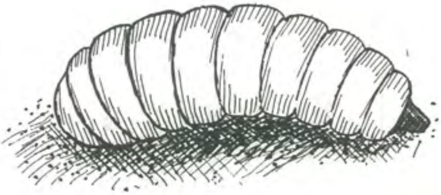
EGG



ADULT



PUPA



LARVA

The drawings on the opposite page show the stages in the life cycle of a house-fly. See if you can find out in what order they occur. You can begin your investigation by placing a piece of raw meat in a large jar.

Put the jar outside and leave it for a few hours.

Next, bring the jar in and put a top on it. This will stop odours from spreading.

Look carefully at the meat in the jar. Can you see anything on the meat?

Look at the jar from time to time during the next few weeks.

✍ 4.1 Write a report on page 24 of your record book about what you observed and illustrate it by drawing each stage of the life cycle.

✍ 4.2 In what ways is the life cycle of an insect different from the human life cycle? In what ways is the life cycle similar?

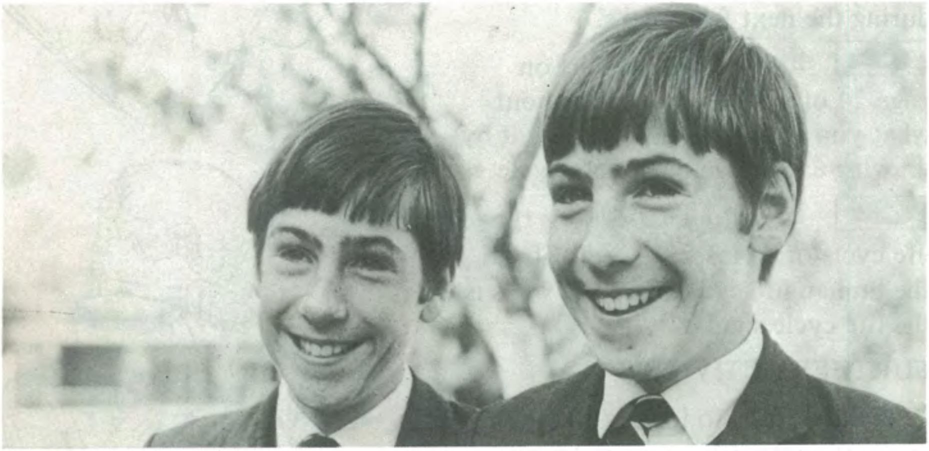
FURTHER ACTIVITIES

You may like to look at the life cycle of another insect, e.g. Emperor gum moth, wasp, butterfly, painted apple moth, vinegar fly, cockroach or silverfish.

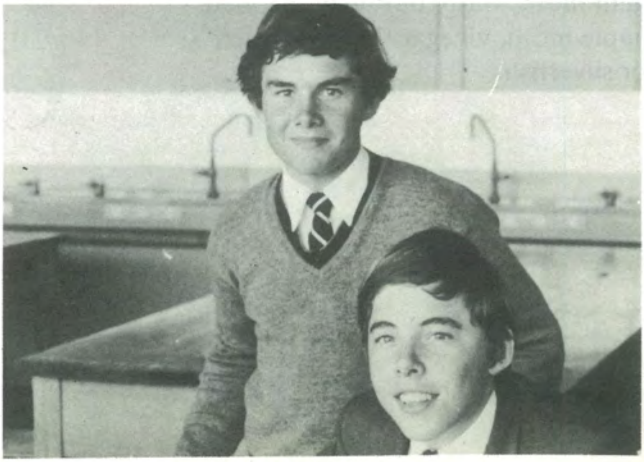
OPTION 5

You can find out how twins are formed.

TWINS



These two boys are twins.



These two boys are also twins.

Can you see many differences between the pairs of twins? Why do some women give birth to twins? See if you can find out why some twins look the same (first photo) and some do not (second photo).

In many biology books you can find out about 'multiple births'. Here is a list of some books you may have in the school library.

Australian Academy of Science. *Biological Science: The Web of Life.* Canberra, 1973. p.648.
Beck, L.F. *Human Growth* (new school ed.). New York, Harcourt, Brace and World, 1969. pp.75–78.
Head, J.J. *How Human Life Begins.* London, Murray, 1970. pp.42–43.
MacKean, D.G. *Introduction to Biology.* 2nd ed. London, Murray, 1963. p.114.
Villee, C.A. *Biology.* 4th ed. Philadelphia, Saunders, 1962. p.447.

Do you know a pair of twins? Are there any twins in your school? It would be interesting to talk to them and see just how alike they really are.

5.1 There is space on pages 26 and 27 of your record book to record your findings.

OPTION

6

You will find examples of the way animals care for their young.

HOW ANIMALS CARE FOR THEIR YOUNG

A chimpanzee nursing its baby.
(Photo by courtesy of the Melbourne Zoological Gardens.)

A foal feeding from a mare.

How do other animals care for their young? The best way to find out about this would be to look at some animal parents with their young.

You may be able to visit a farm or zoo and watch animal parents. Compare the behaviour of various animal parents with human parents while caring for their young.

You may own some animals that have young. Mice breed quickly and would be suitable animals to study. ASEP's *Keeping Small Mammals* will tell you how to care for mice.

You can read about how animals care for their young in the following books.

The Mammals. The Primates. New York, Time-Life International, 1963–65. (Life Nature Library)

Frauca, H. *Australian Animal Behaviour.* Melbourne, Lansdowne, 1971.

Lawick-Goodall, Jane van. *In the Shadow of Man.* London, Collins, 1971.

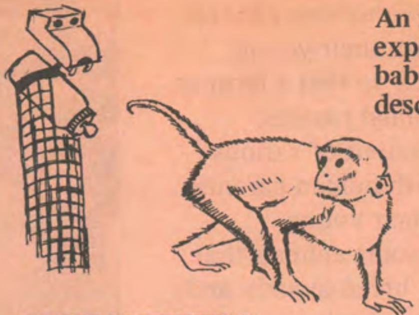
6.1 There is space on pages 28 and 29 of your record book to report your findings. It may be a good idea to illustrate your report with photos.

Lyre-bird feeding its chick.
(Photo by courtesy of Dr L.H. Smith)

Koala carrying her baby.
(Photo by courtesy of the Fisheries and Wildlife Department, Victoria)

OPTION

7

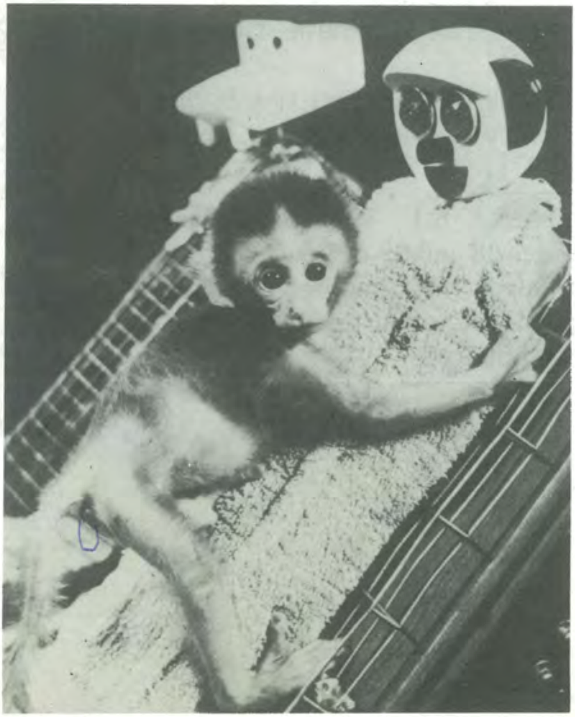


An interesting experiment about baby monkeys is described to you.

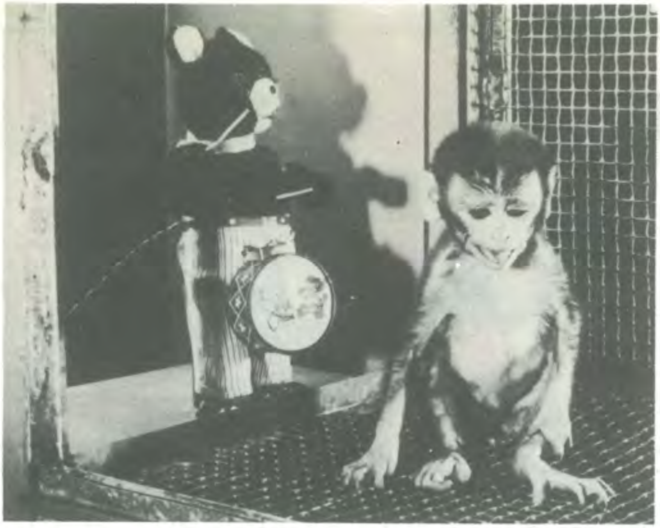
WIRE MOTHERS

This is an account of an interesting experiment done in the USA by H. Harlow in 1959. He investigated the behaviour of infant monkeys.

He placed a new-born monkey in a cage with two 'mothers'. These 'mothers' were not monkeys. They were made of wire. One wire 'mother' had milk bottles from which the baby fed. The other wire 'mother' was covered with a soft cloth (a piece of terry towelling).



The baby monkey is clinging to the cloth 'mother'. The wire mother from which it gets its food is shown in the background.



A toy Teddy bear was put into the cage. Note the monkey's reaction.

When frightened, the monkey always ran to the cloth 'mother'.
(Photos by courtesy of the University of Wisconsin.)

Frightening objects such as a mechanical Teddy bear caused the baby monkey to race to the cloth 'mother'.

Once reassured by pressing and rubbing against her, the baby monkey would look at the strange object.

Although the baby monkey fed from the wire 'mother' it spent most of its time clinging to the soft cloth 'mother'.

Whenever it was frightened, the baby monkey always ran to the cloth 'mother'.

Harlow tried this with a number of baby monkeys. They always behaved in the same way. What do you think this experiment shows? Do you think the baby monkey needed **love** from the cloth 'mother'?

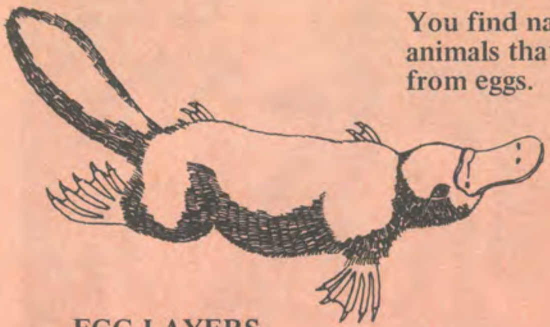
Do you believe that this experiment applies to humans? Do you think human babies need this sort of comfort and love?

7.1 Discuss these questions and use page 30 of your record book to record your findings.

More details of this experiment are given in *Scientific American,* vol. 200, no. 6, June 1959, pages 68 to 74.

OPTION

8



You find names of animals that hatch from eggs.

EGG LAYERS

Emu.

The platypus is a mammal, as you are. Mammals are animals that have hair on their bodies and feed their young with milk from mammary glands. However, the platypus is different from other mammals because it lays eggs. One other Australian mammal lays eggs. What is its name?

What other animals lay eggs? Here are photos of some. Make a list of these and other animals that lay eggs. You may be able to find some pictures to illustrate your list.

In some animals the embryo grows inside the mother's body. In egg-laying animals it grows outside the mother's body in an egg. Which way do you think is better? Give reasons for your answer.

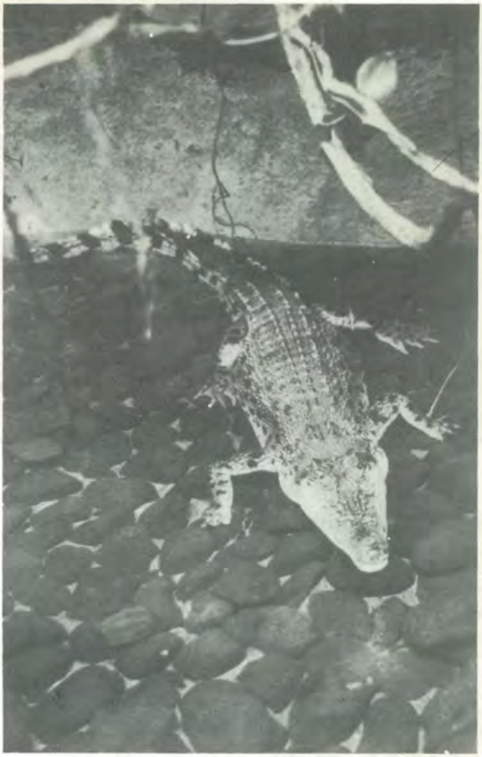
Tortoise.

The books listed below may be helpful to you:

Brazenor, C.W. *The Mammals of Victoria and the Dental Characteristics of Monotremes and Australian Marsupials.* Melbourne, Brown Prior Anderson, 1950. pp. 11–13.
Frauca, H. *Bush Dwellers of Australia.* Adelaide, Rigby, 1967. pp. 14–15.
Frauca, H. *Encounters with Australian Animals.* Heinemann, 1963.
Ride, W.D.L. *Native Mammals of Australia.* Melbourne, Oxford University Press, 1970. Chapter 12.
Sharland, M. *Tasmanian Wildlife.* 1st ed. Melbourne University Press, 1962. Chapter 5.
Troughton, E. *Furred Animals of Australia.* 7th ed., Sydney, Angus and Robertson, 1962. pp. 1–12.

You may also find other books and magazines about Australian animals that will be helpful.

8.1 You can use page 31 of your record book to answer the questions and record your findings.



Crocodile.

Snake.

OPTION

9

You can find out how cows can have calves without the presence of a bull.

ARTIFICIAL INSEMINATION

The farmer who owns these cows and their calves has no bull on his farm. He has never owned a bull or allowed another bull near his cows. But his cows did produce calves. This may sound impossible but it can be done. Semen, containing sperm, can be stored for long periods at low temperatures. The semen may be transported from one country to another. It is possible for a merino ram in Australia to be the father of hundreds of sheep in other parts of the world.

See if you can find out how artificial insemination can be done. You might be able to find information in encyclopaedias, biology books and journals of agriculture.

You might like to discuss some of the advantages and disadvantages of this type of reproduction.

✍ 9.1 You can use page 32 of your record book to record your findings.

OPTION 10

You look at the life cycle of a frog.
You can do this option only if frogs eggs or tadpoles are available.

TADPOLES AND FROGS

Frogs eggs.

You probably know that tadpoles grow into frogs.

To watch them do this you will need:

- some frogs eggs (or young tadpoles without legs)
- a large jar or aquarium tank
- pond water (try to get this with the eggs or tadpoles)
- water weeds (e.g. algae) for the tadpoles to feed on.

Tadpoles or frogs eggs can be found in some freshwater ponds. The best time to look is late in the year. Someone in your class may know where they can be found.

9

10

Put the eggs or tadpoles in the jar with plenty of pond weeds. Look at them from time to time during the next eight to ten weeks.

10.1 On page 33 of your record book make drawings of the tadpoles as they grow and change. See if you can find out how frogs eggs are fertilized.

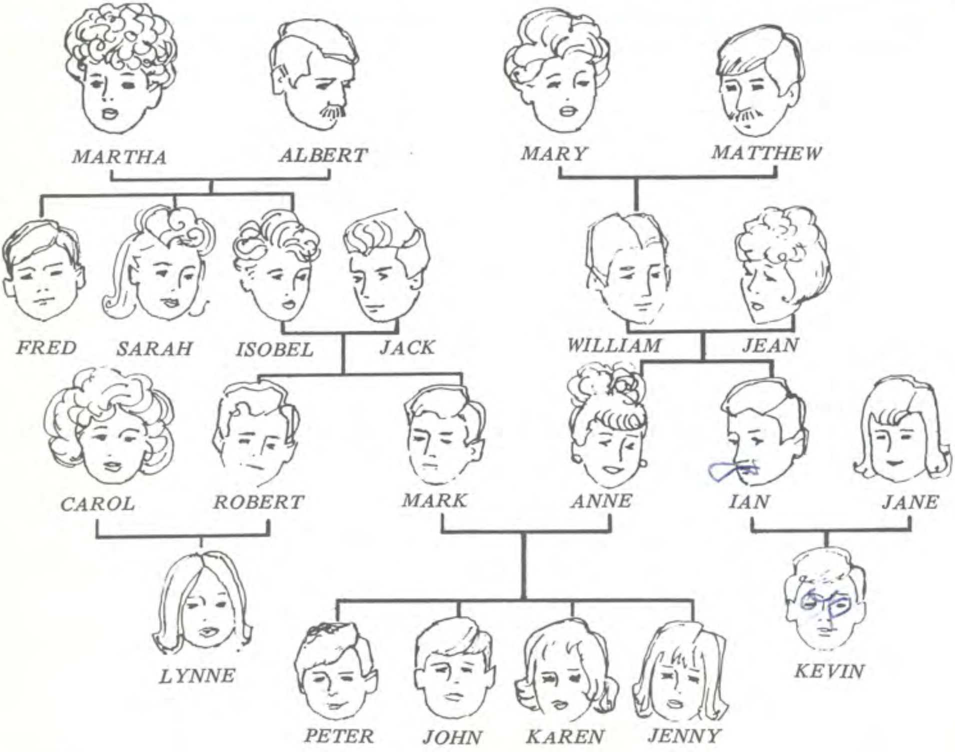
10.2 In what ways is the reproduction of frogs different from and similar to human reproduction?

OPTION

11

You can make your own family tree.

A FAMILY TREE



11.1 Try to work out how the family tree above is drawn. See if you can work out what relation Karen is to Albert. Work out any others you may choose.

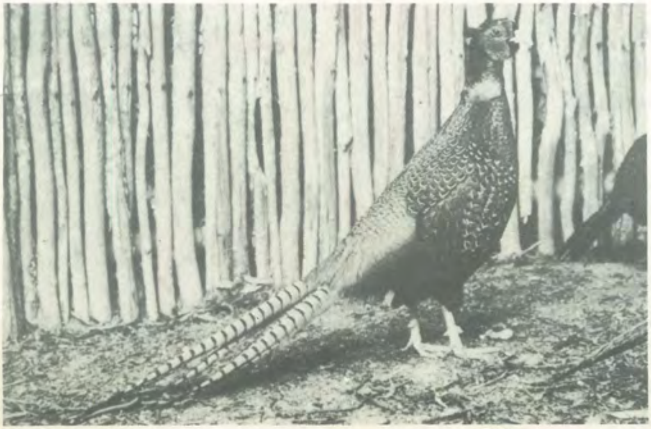
11.2 Make a family tree for your own family on page 34 of your record book. You may be able to make a 'family' tree for a pet cat or dog. Animal family trees are usually called **pedigrees**.

OPTION 12

You can find out how animals attract their mates.

COURTSHIP BEHAVIOUR IN ANIMALS

One of these toads is croaking. What function could this have?

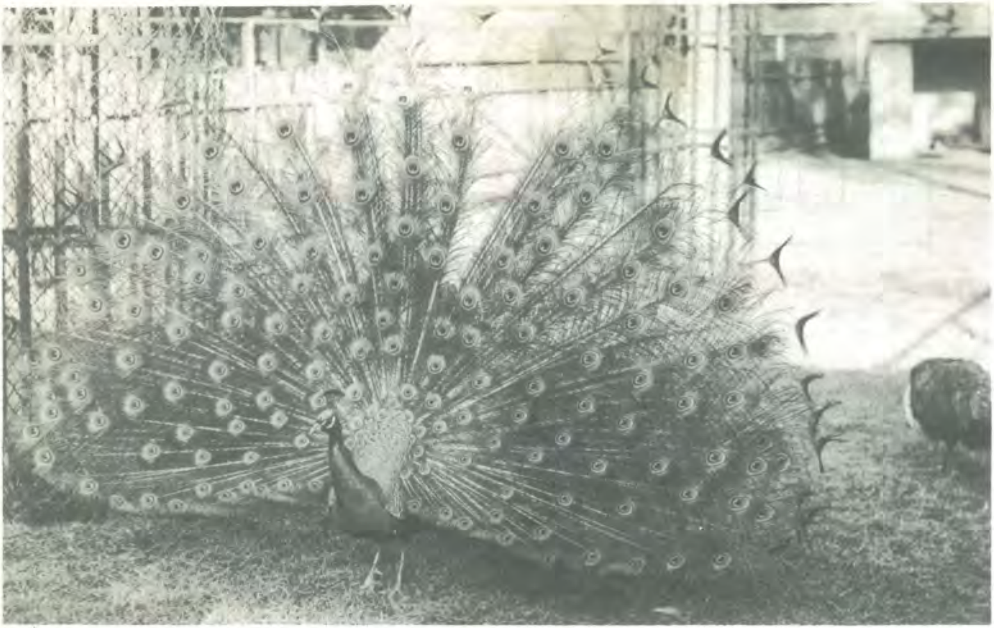


This pheasant is brightly coloured. What function could this have?

(Photo by courtesy of the Melbourne Zoological Gardens.)

11
12

This peacock is spreading its tail. What function could this have?



(Photo by courtesy of the Melbourne Zoological Gardens.)

The sexes are attracted to each other in many different ways in the animal kingdom.

Animals are attracted to one another at certain times of the year. One sex does something that attracts the other sex. This is called **courtship.**

As a result of courtship, the animals may pair together and mate.

Use books to try to find out about the courtship behaviour of other animals. Two books you may be able to use are:

Frauca, H. *Australian Animal Behaviour.* Melbourne, Lansdowne, 1971.
Selsam, M.E. *The Courtship of Animals.* New York, William Morrow, 1964.

You may also be able to find other books about animal behaviour.

12.1 You could record your findings on page 35 of your record book.

You may also like to discuss whether there is any pattern of courtship behaviour among humans.

CHECK YOUR ANSWERS

Check your answers carefully with the answers given here. If you cannot agree with a given answer, discuss it with another student, or go back to the particular section of work and study that section again.

If you are still in doubt, ask a teacher.

TEST YOURSELF (Part One)

1 **Penis**

2 **Testis** This is where the sperms are produced.

3 **Scrotum**

4 **Ovary** This is where the egg cells (ova) are produced.

5 **Oviduct** The oviducts are the passages through which the eggs move to the uterus.

6 **Uterus** This is where the fertilized egg develops.

7 **Vagina** The vagina is a passage leading from the uterus to the outside of the body.

8 **Labia** These are the folds of skin around the vaginal opening.

9 **Menstruation**

10 **D** At birth a girl has thousands of undeveloped eggs in each ovary. After puberty one developed egg cell is released from an ovary about every four weeks.

11 **B** The foreskin covers the end of the penis at birth.

12 **A** The egg is so small that is difficult to see.

13 After a girl reaches puberty

1. menstruation occurs monthly
2. hair grows on her body (e.g. under arms and on labia)
3. her breasts develop.

Other changes may also occur, e.g. her body becomes more rounded.

14 After a boy reaches puberty

1. his testes begin to produce sperm
2. hair begins to grow on certain parts of his body, e.g. the face, under the arms, around the genital organs
3. his voice becomes deeper.

There are other changes which may also occur, e.g. height and weight increase markedly.

Check Your Answers continued next page

TEST YOURSELF (Part Two)

1 **Ovary** An egg is released about once a month.

2 **Vagina** Movement of the penis in the vagina causes semen, containing sperm, to be ejected.

3 **Oviduct**

4 **Uterus** If the egg is fertilized, it divides repeatedly to form a cluster of small cells. The cluster then becomes implanted in the thick lining of the wall of the uterus.

5 **D** The placenta is an organ in which the blood vessels of the mother and the developing foetus are close together.

6 **F** The developing foetus floats in the sac of liquid, which protects it.

7 **E** About two months after fertilization the embryo develops features which can be recognized as human. From this time until birth the developing baby is called a foetus.

8 **C** The developing foetus is attached to the placenta by the umbilical cord.

9 **B** The blood of the developing foetus and the blood of the mother do not mix. However, the close contact of blood vessels of the mother and foetus in the placenta allows food and oxygen to be passed to the foetus. The placenta also serves to rid the foetus of waste products.

- A This is the function of the sac of liquid.
- D A woman does not menstruate when she is pregnant.

10 **D** This is about nine months. It is the time that elapses between fertilization and birth.

11 **C**

- A The ovaries release egg cells in the female.
- B The bladder stores urine.

12 **C** During menstruation the lining of the uterus is shed. After this the lining gradually thickens until it is fully developed just prior to the next menstruation.

13 **Vagina**

14 The major reason for the children's aggression, according to the researchers, was that the children did not have as much personal care and attention as do children with parents. It appears from the evidence available that insufficient care from adults may harm a child's development.

Many people were involved in the development and production of ASEP units.

As well as the ideas and suggestions contributed by ASEP staff members, valuable help was given by consultants, students and teachers throughout Australia during trials.

We also gratefully acknowledge the help given by members of the many organizations who have taken such a keen interest in the development of this unit.

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Photographer:	Brian Oakes (V) 1971–72

ISBN 0 7241 1072 0

C. H. RIXON
GOVT. PRINTER. MELBOURNE